The Electrical Industry's Weekly Magazine

January 23, 1956

Electrical World

A McGraw-Hill Publication

Price $1.00

ELECTRICAL INDUSTRY STATISTICS

52nd Annual Report on the Electrical Industry

November 1, 1955

	Number of Utilities*	Number of Plants*	Total Capacity	Hydro		Steam		Internal Combustion	
				Number	Capacity	Number	Capacity	Number	Capacity
UNITED STATES	1,431	3,625	112,133,782	1,392	24,745,550	1,051	85,031,495	1,182	2,356,737
New England	94	312	5,249,425	203	1,0 141	74	4,065,875	35	101,209
Maine	19	83	3	56	3,	9	235,650	18	39,460
New Hampshire	11	10	3	30	55,714	6	213,250	1	2,040
Vermont	33	32	4,709	57	186,937	8	56,775	6	15,045
Massa	6	10	401,352	32	180,212	31	1,965,380	7	27,117
Rhode	11	32	1,348,460	3	2,475	5	388,330	2	10,547
Conne				16	134,970	15	1,206,490	1	7,000
Middle Atlantic	86	302	17,957,355	158	1,690,087	118	16,199,569	26	67,699
New York	45	203	8,357,199	145	1,247,292	43	7,063,595	15	46,312
New Jersey	10	20	2,719,456	3	6,350	15	2,709,024	2	4,082
Pennsylvania	31	79			436,445	60	6,426,950	9	17,305
East North Central		38	24,5 152	262	861,152	228	23,701,803	148	349,197
Ohio	52	7	6,990,057	5	10,525	62	6,937,490	20	42,042
an	41	68	3,987,798	14	35,170	39	3,915,780	15	36,848
is	54	101	6,917,636	10	47,909	60	6,786,583	31	83,144
igan	63	186	4,589,650	110	396,097	34	4,063,375	42	130,178
Wisconsin	64	196	2,427,011	123		33	1,998,575	40	56,985
West North Central	452	863				224	5,970,563	527	950,498
Minnesota	82		64			53	1,428,552	84	179,641
Iowa		114	1,55 12			49	1,163,791	122	248,280
Missouri			1,74 4	6	139,441	35	1,420,115	73	134,586
ta	12	68	263,517	0	193,073	19	224,790	26	38,727
ta	3		491,204	7	0	11	137,550	50	69,158	
raska	73	136	762,999	30	284,496	20	512,265	86	109,426
ansas	84	127	1,260,090	4	141,308	37	1,083,500	86	170,680
South Atlantic	132	372	15,044,520	167	5,910	121	11,544,695	84	181,020
Delaware	4	6	223,898	0	3,318,805	4	216,100	2	7,798
Maryland	11	22	1,372,517	3	0	12	1,085,000	7	16,192
District of Columbia	2	3	533,000	1	271,325	2	530,000	0	0
Virginia	23	65	1,931,249	38	3,000	15	1,502	12	28,957
West Virginia	10	34	2,184,541	10	399,672	18	2,	8	3,996
North Carolina	30	88	3,481,080	58	100,880	16	2,331,750	11	
South Carolina	13	40	1,671,059	37	45	9	737,500	4	
Georgia	9	39	1,6	2	475,810	11	1,	5	4
Florida	3	75	1,	4	12,66	23	1,8 10	38	2,250
East South Central	44	120	11,310,173		80	53	7,712,160		94,395
Kentucky	13	31	2,758,057		540,860	23	2,208,925	27	29,933
Tennessee	8		7,963	23	1,736,000	10	2,707,500	3	8,272
Alabama	2	28	3,473,620	12	1,291,220	10	2,180,000	3	4,463
Mississippi	19		630,533	0	0	10	615,735	3	2,400
West South Central	158	349	9,334,439	37	945,000	112	7,975,229	18	14,798
Arkansas	18	34	1,165,286	8	388,340	12	745,895	200	414,210
Louisiana	30	60	1,469,801	0	0	16	1,375,100	14	31,051
Oklahoma	40	66	1,262,464	4	165,700	22	1,010,584	44	94,701
Texas	70	189	5,436,888	25	390,960	62	4,843,650	40	86,180
Mountain	138	376	6,093,615	190	3,703,274	71	2,182,078	102	202,278
Montana	8	25	925,152	18	850,910	4	71,800	115	263
Idaho	12	47	781,335	42	777,020	0	0	5	2,442
Wyoming	19	51	236,073	19	143,382	12	79,320	20	4,315
Colorado	37	77	947,528	28	247,517	23	662,398	26	13,371
New Mexico	15	32	457,453	4	24,910	13	393,110	15	37,613
Arizona	14	43	1,627,390	12	980,040	11	577,950	20	39,433
Utah	26	85	521,596	58	93,315	8	397,500		
Nevada	7	16	597,088	9	586,180	0			
Pacific	53	293	14,393,143	223					
Washington	19	55	3,939,727						
Oregon	14	72							
California	20								

* Total [illegible]

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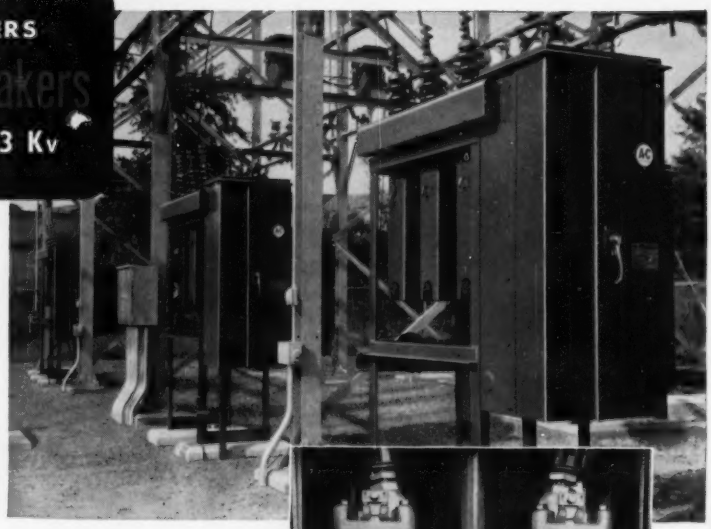
The Distribution Breaker With

BIG BREAKER FEATURES

ALLIS-CHALMERS

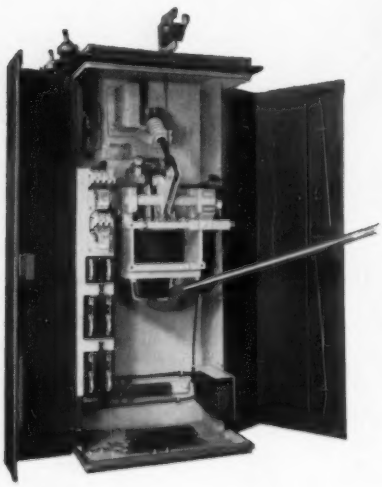
OZ Circuit Breakers

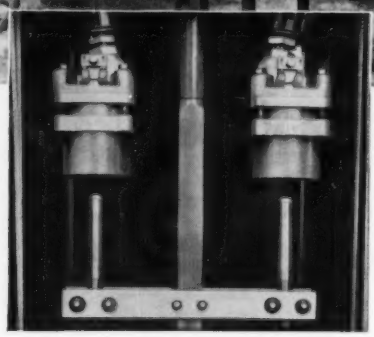
for service up to 23 Kv



Tank per phase

construction (as used in large breakers) completely isolates phases and eliminates internal phase-to-phase flashover.





Double break

per phase principle used with time-proved *Ruptor* interrupting devices. Self wiping, self aligning tulip and bayonet contacts used.

Other quality features include: fabricated wiring duct to simplify access to bushing transformer leads; non-buckling, non-warping tank liners; both external and internal position indicators.

Roomy cabinet

Side hinging of L-shaped doors allows access to operator from three sides. Relays, when specified, are in separate cabinet.

GET INFORMATION

New 8-page descriptive bulletin No. 71B7946 now available. Call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Ruptor is an Allis-Chalmers trademark.

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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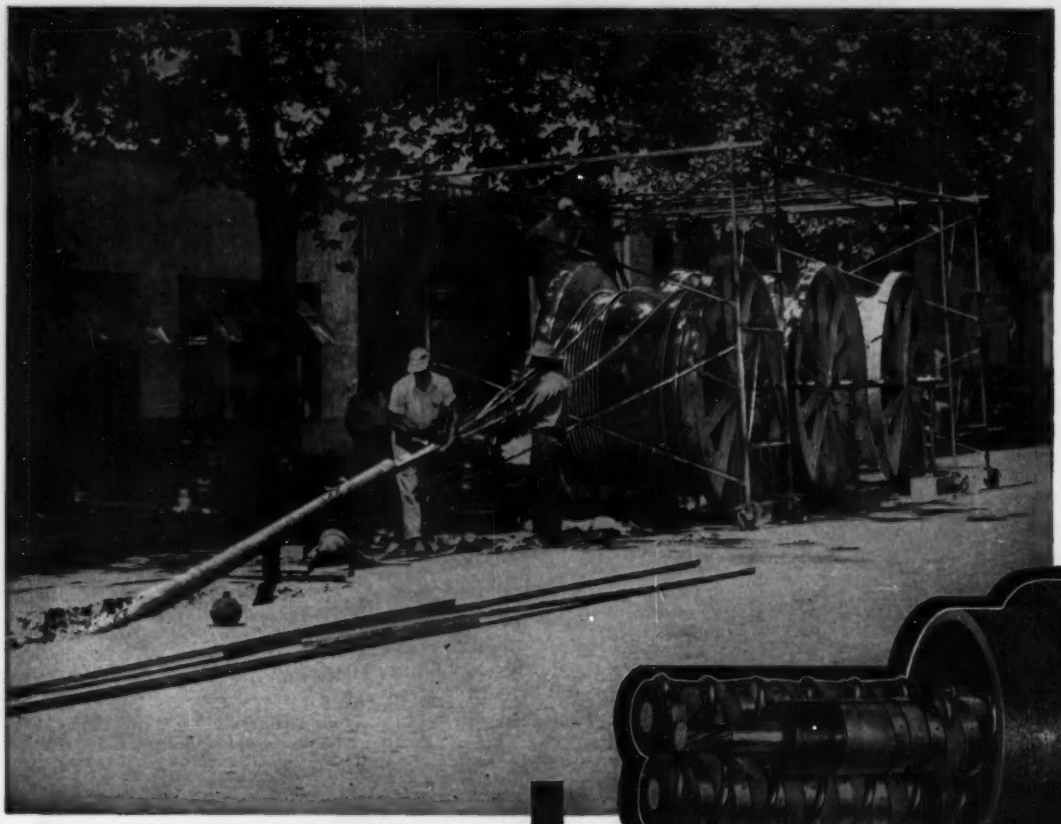
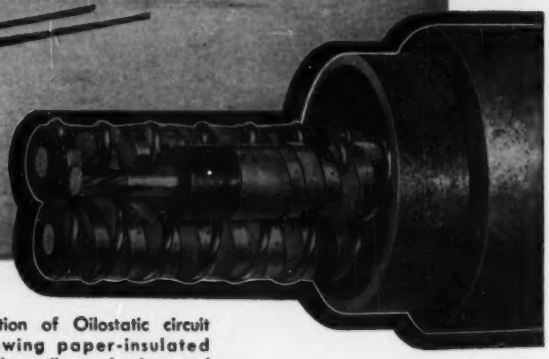


Three conductors for one of the two 115kv Oilostatic circuits are pulled in.



Section of Oilostatic circuit showing paper-insulated cables, oil, steel pipe and corrosion protective covering.

another utility selects

OILOSTATIC

for economical high voltage transmission

In Sacramento, California, Oilostatic Transmission Systems for two 8,800 foot 115kv circuits were buried directly under the city streets. Simplicity of installation, economy, and service-proved reliability dictated the choice of this type of installation to carry 70 MVA per circuit.

Oilostatic Systems consist of paper-insulated cables in a welded steel pipe filled with oil under 200 psi pressure. This system provides maximum dielectric strength, stability, and current-carrying capacity. Automatic pressure controls and indicating instruments reduce the necessity for inspection to an absolute minimum.

Compact construction is ideal in tunnels, on bridges or under congested streets instead of bulky duct banks. Oilostatic is also adaptable for submarine installations. Write for full information on design and installation of Oilostatic Transmission Systems to The Okonite Company, Passaic, N. J.

Available with either copper or aluminum conductors

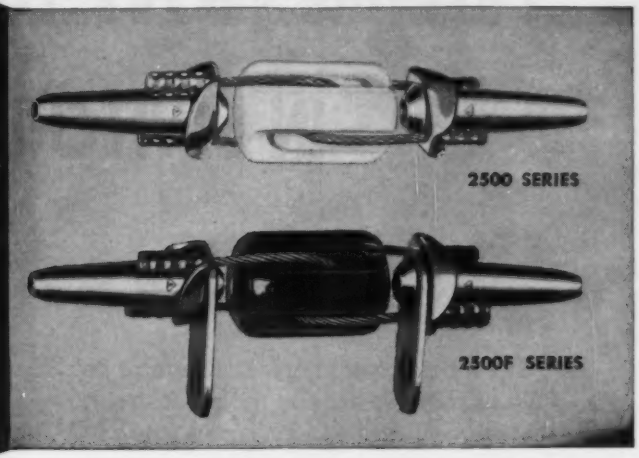
OKONITE SINCE 1878 ***insulated cables***

2629

for the largest number of line applications at the lowest possible cost...

USE *Electroline*

Insulating Automatic Line Splice SECTIONALIZERS



The Electroline Sectionalizers are assemblies that will function in service as most convenient, reliable and yet low cost interrupting devices. Series 2500-F and 2600 provide for paralleling with a fuse element for further protection when sectionalizing. The mechanical strength of these assemblies exceeds in all cases the rated breaking strength of the conductor for which they are adapted.

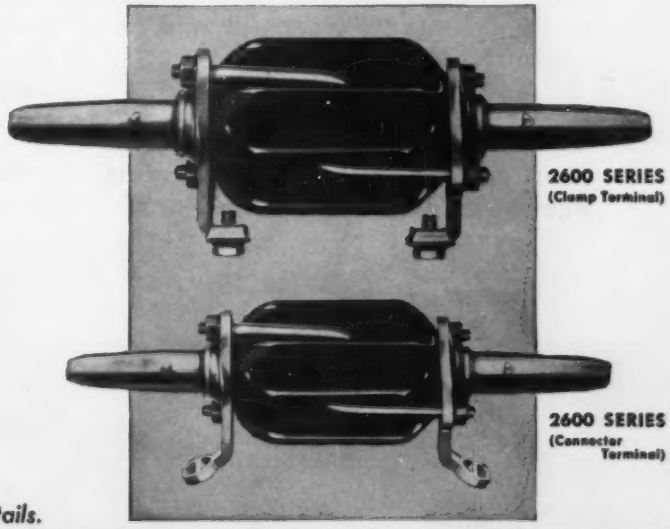
These Insulating Automatic Line Splice Sectionalizers are ideal for:

Installing Regulating Equipment,
simplifies cutting-in disconnecting points, fuses, voltage regulators and series capacitors;

Restoring Service,
providing points to test for trouble;

Sectionalizing Networks,
to readily isolate and test the area in trouble;

Series Street Lighting,
simplifies cutting-in series street lamps—merely cut the line and insert conductor ends into sectionalizer.



Send for Bulletins containing complete details.

TALENT TO ORIGINATE E ABILITY TO PRODUCE

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

PREPARE NOW FOR TOMORROW'S IN SWITCHING DISTRIBUTION

It's a matter of simple addition to get this modern device for the switching of distribution feeders . . . because an S&C Load Interrupter consists of an interrupting unit added to a disconnect switch.

And with an S&C Load Interrupter you can switch the modern way. You can drop the load—all of it—at once. No need to go through complicated unloading preliminaries—no need to open main breakers causing otherwise unnecessary interruptions. Outages are held to a minimum—line repairs can go forward immediately.

In addition, you can switch the circuit any time under any condition (except short circuit) . . . valuable protection against inadvertent operation or operation under emergency conditions. Switching with S&C Load Interrupters cannot lead to dangerous phase-to-phase or phase-to-ground faults. It cannot endanger men or equipment because there is no external arc.

If you've been delaying the use of S&C Load Interrupters because of budgets, remember that you can install S&C Convertible Disconnects *without* the interrupting units at the same price as conventional disconnects. Then, when you're ready to convert, you can quickly install the low-priced interrupting units with a hot line tool *without de-energizing the circuit.*

Ask your nearest S&C sales representative for information.

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

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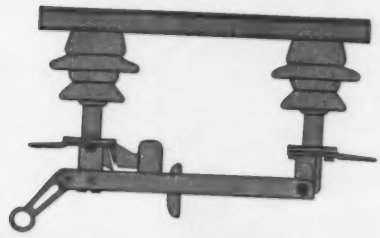
POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

PROBLEMS

FEEDERS

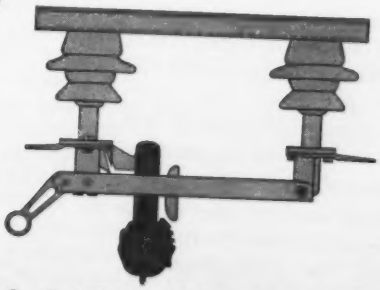


S&C CONVERTIBLE DISCONNECT

plus

INTERRUPTING UNIT

Equal



S&C LOAD INTERRUPTER

Catalog Section 760 tells in detail how the S&C Load Interrupter improves operating practices and saves money.

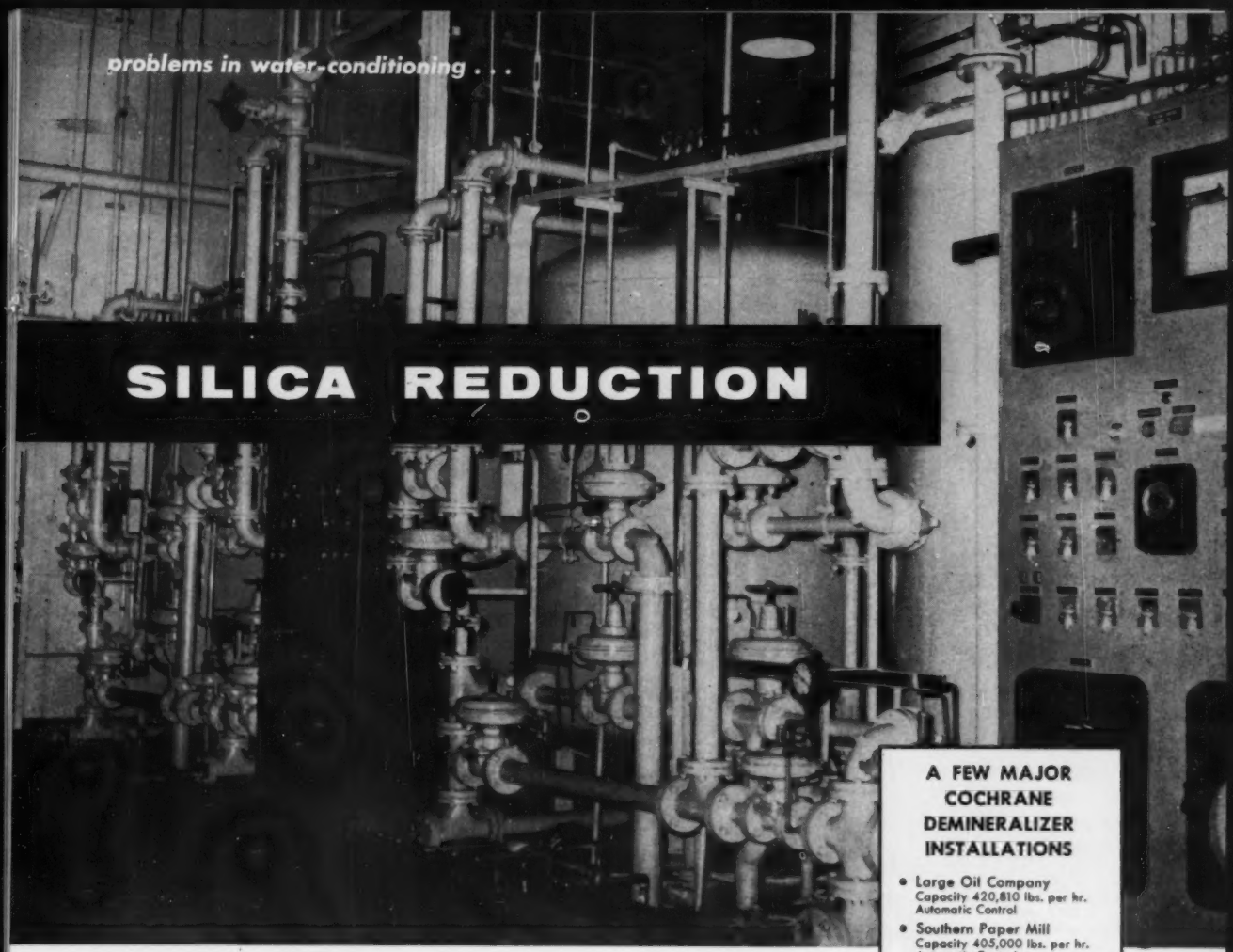
Now a new standard of safety in low-voltage switchgear

Test position with doors closed

This exclusive I-T-E low voltage switchgear feature establishes a new standard of safety in testing circuit breakers. It offers the additional advantages of reduced handling; less maintenance; convenient "tagging out"; better dust protection; easier circuit identification. And all are yours at no increase in cost in the compact, modern design of I-T-E low-voltage switchgear.

For complete information, contact your nearest I-T-E sales office. Or write for Bulletin 6004B. I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY
Switchgear Division



A FEW MAJOR COCHRANE DEMINERALIZER INSTALLATIONS

- **Large Oil Company**
  Capacity 420,810 lbs. per hr.
  Automatic Control
- **Southern Paper Mill**
  Capacity 405,000 lbs. per hr.
  Automatic Control
- **Textile Manufacturer**
  Capacity 360,000 lbs. per hr.
  Automatic Control
- **Utility**
  Capacity 266,400 lbs. per hr.
  Automatic Control
- **Aluminum Producer**
  Capacity 387,000 lbs. per hr.
  Automatic Control
- **U.S. Government**
  Capacity 298,800 lbs. per hr.
  Automatic Control
- **Automobile Manufacturer**
  Capacity 182,268 lbs. per hr.
  Automatic Control
- **Pharmaceutical Company**
  Capacity 29,880 lbs. per hr.
  Automatic Control
- **Chemical Manufacturer**
  Capacity 15,000 lbs. per hr.
  Manual Control
- **Steamship Installation**
  Capacity 1,776 lbs. per hr.
  Manual Control

For your protection
buy **Cochrane's** *experience*
in demineralization

An impressive list of Cochrane 2-bed, 3-bed, 4-bed and mixed bed Demineralizer installations have been providing continuous protection for years in many outstanding high pressure power plants in public utility and industrial fields.

The illustration above is just one of many such installations. Designed for a large paper company, it produces an effluent with a silica content of as low as 0.02 ppm and total dissolved solids of as low as 0.4 ppm. Cation units are 6′ x 6′ and anion units 6′ x 8′ providing demineralized water supply of over 100,000 lbs. per hour for 1200 psi boilers.

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CORPORATION

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"Compresto*Cable"

THE COMPACT CONDUCTOR

THAT WEIGHS LESS . . .

INCREASES SAFETY FACTOR . . .

WITHOUT ADDED COST

"Compresto*" is adaptable to self-supporting service drop cable, or weather resistant service wire.

"Compresto*" is the result of a special drawing technique that produces a flexible conductor of small diameter, yet maintaining the full aluminum cross-sectional area.

"Compresto*" has greater contact surface area for available connectors without loss of physical properties through deformation of conductor.

"Compresto*" eliminates the voids of an ordinary stranded conductor, reducing the weight by about 10% without reducing the insulated wall thickness.

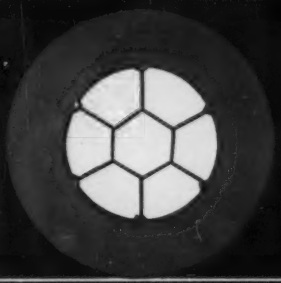
"Compresto*" was developed and is manufactured by

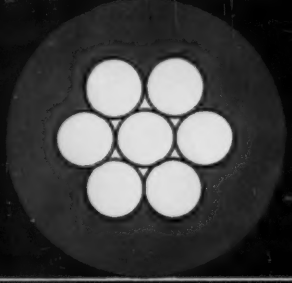
Southern Electrical Corporation

CHATTANOOGA, TENNESSEE

* Registered U.S. Patent Office

"Compresto**"





"Ordinary"

"Compresto *Cable"

has the same aluminum area and conductivity, and the same dielectric protection as ordinary cable.

Manufactured under SOUTHERN ELECTRICAL CORPORATION'S Quality Control.

"Compresto *Cable" now available with

- Neoprene covering processed by Western Electric Company's Licensed Improved Room Temperature Method

or —

- Polyethelene covering

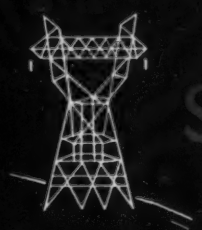
or —

- Two Coat** rubber insulated, Neoprene jacket

Select Compresto with covering of your choice, but always specify Southern Electrical's Superior Quality Control products, identified by the Blue Thread.

Compresto cable is available on our no-charge, non-returnable reels, or in standard coils or packages to your specifications.

Applicable Fittings Are Available.

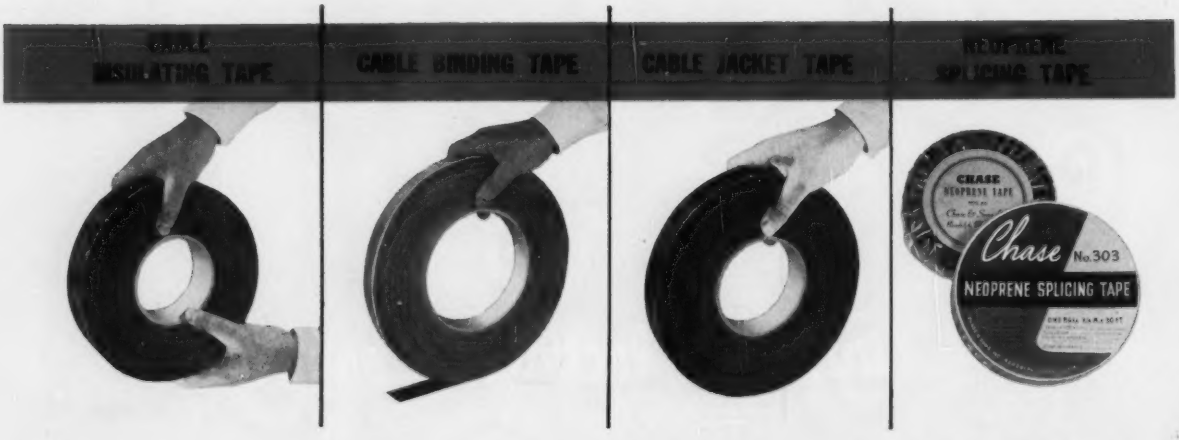


Southern Electrical Corporation

CHATTANOOGA, TENNESSEE

** Trademark

ONE OF MANY Chase cable tape applications is shown above where one-inch single-faced rubber-filled tape is applied to tree wire for utility companies. Other applications include the use of binding tapes, insulating tapes, ozone resisting tapes, moisture seal barrier tapes, flame retardent tapes, conducting tapes, high heat resistant tapes, high dielectric tapes . . . and that particular one designed especially for you.



wire and cable insulating tapes are manufactured to exacting specifications . . . of the best materials available . . . to meet a wide variety of electrical tape and insulation requirements.

insulation characteristics make the Chase tape line extremely popular among original equipment manufacturers . . . and in large wire and cable plant operations . . . where dependability is mandatory.

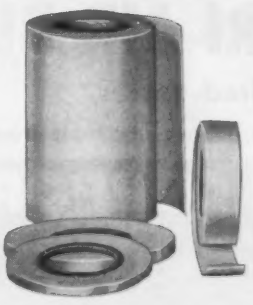
manufacturers and maintenance personnel of high dielectric and tensile strength . . . in fabric, plastic, rubber or neoprene constructions . . . because of constant research and exclusive manufacturing techniques.

interruptions are cut to a minimum . . . among many major utility companies . . . who rely more and more on versatile Chase tapes to provide the perfect combination of high insulation strength and long life.

never before possible are packed into the entire Chase tape line. Chase tapes are quality tapes . . . and there's a Chase tape designed to meet your particular wire or cable insulating requirements.

For complete data on the Chase products which interest you, simply check the coupon, attach to your letterhead, and send to CHASE & SONS, INC., RANDOLPH, MASS.

FRICTION, RUBBER & PLASTIC TAPE



EXTRUDED & REINFORCED INSULATION

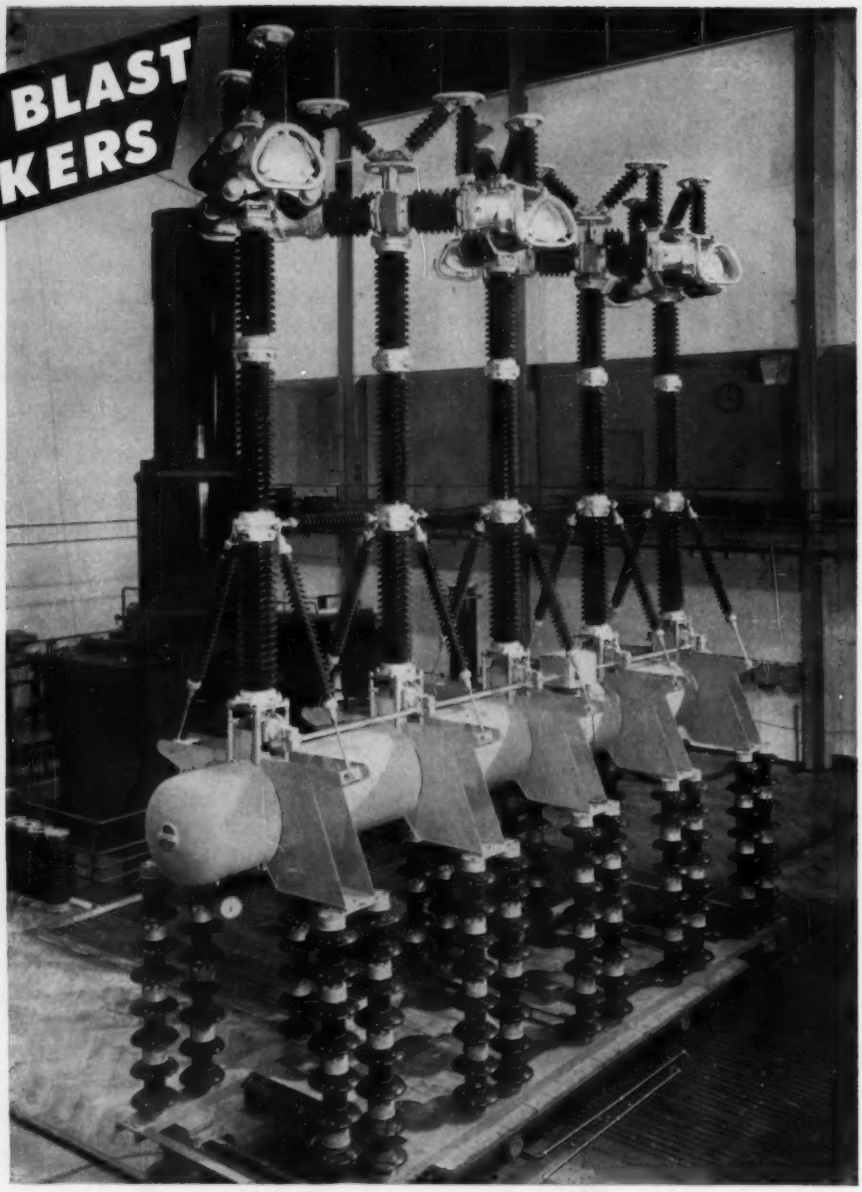
CLIP AND ATTACH TO YOUR LETTERHEAD

Please send more information on the items checked below:

- ☐ Class "B" Insulation
- ☐ Class "H" Insulation
- ☐ Slot Insulation
- ☐ Cable Insulating Tape
- ☐ Cable Binder Tape
- ☐ Cable Jacket Tape
- ☐ Neoprene Splicing Tape
- ☐ Friction, Rubber & Plastic Tape

BROWN BOVERI

AIR BLAST BREAKERS



One pole of

330 kv 25,000,000 kva
BROWN BOVERI AIR BLAST BREAKER

for installation in the United States, set up for special impulse coordination tests.

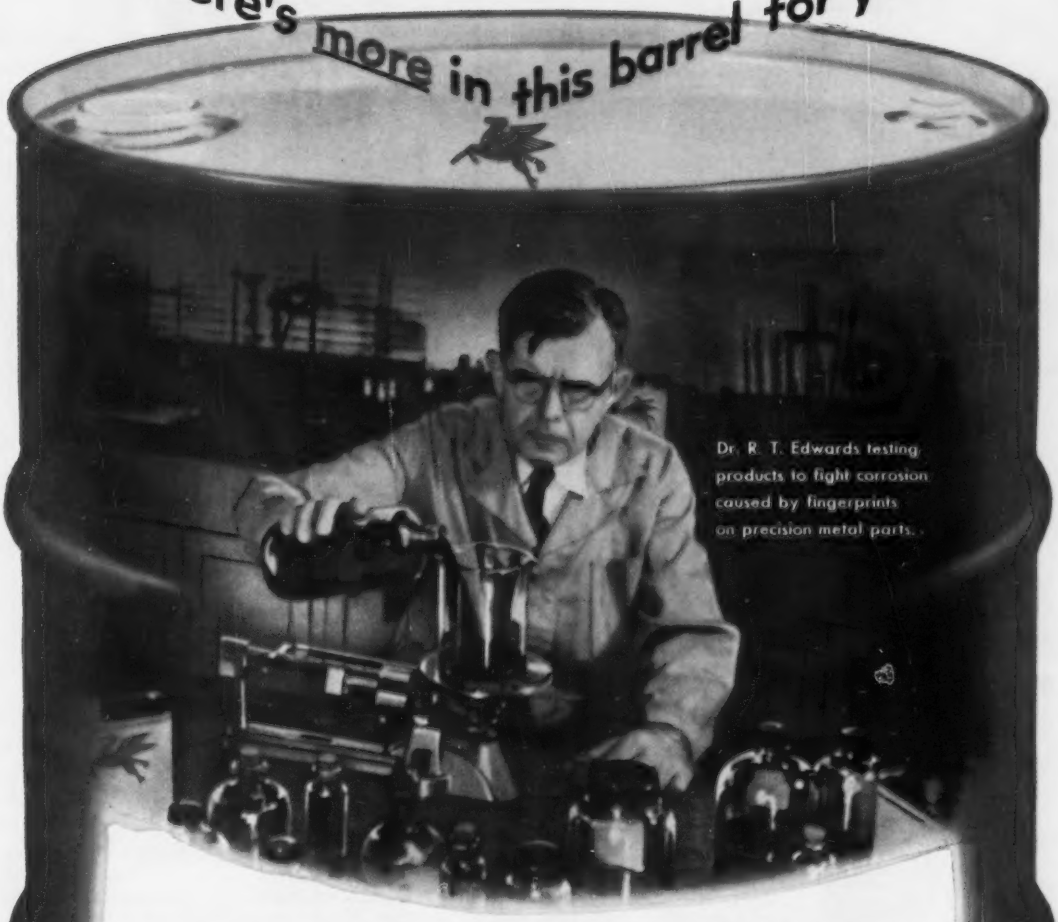
BROWN BOVERI

BROWN BOVERI CORPORATION

19 RECTOR STREET • NEW YORK 6, N. Y.

Atlanta, Ga. • Birmingham, Ala. • Boston, Mass. • Butte, Mont. • Chicago, Ill. • Cleveland, O. • Denver, Colo.
Detroit, Mich. • High Point, N.C. • Jacksonville, Fla. • Kansas City, Mo. • Knoxville, Tenn. • Lewiston, Me. • Los Angeles, Cal.
Minneapolis, Minn. • New Orleans, La. • New York, N. Y. • Portland, Ore. • San Francisco, Cal. • Seattle, Wash. • Tucson, Ariz.

There's more in this barrel for you...



Dr. R. T. Edwards testing products to fight corrosion caused by fingerprints on precision metal parts.

MORE CONTINUOUS RESEARCH

to help you improve production and cut costs!

When you specify "Socony Mobil," you get petroleum products backed by *more continuous research* than those of any other oil company! This means products which are *continually improved* in quality and performance—*new* products when needed. Equally important . . . these complete research facilities are available to *you*—to help improve your production and lower your unit costs.

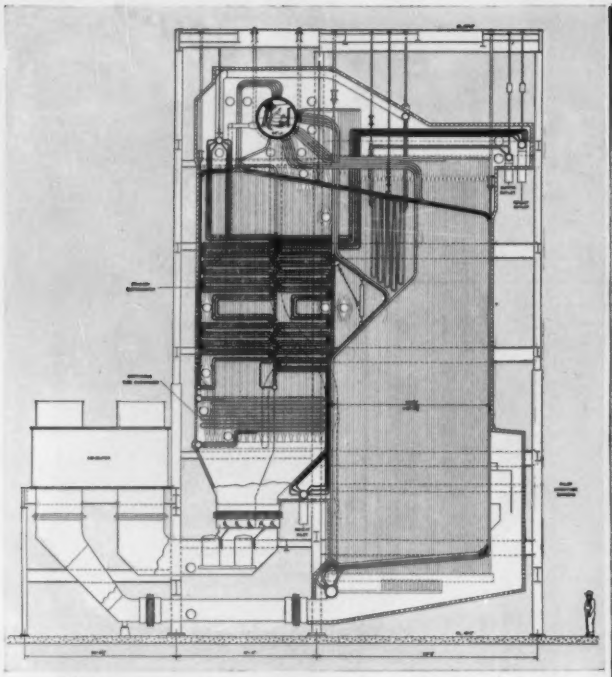
Socony Mobil products are also backed by *more* field engineers serving industry . . . *more* services for analyzing petroleum products in use . . . *more* on-the-job training of your personnel in correct product application . . . *more* approvals from machine builders . . . *more* practical experience—90 years!

Always specify Socony Mobil. There's *more* in every barrel for you!

SPECIFY **SOCONY MOBIL** FIRST STEP IN CUTTING COSTS

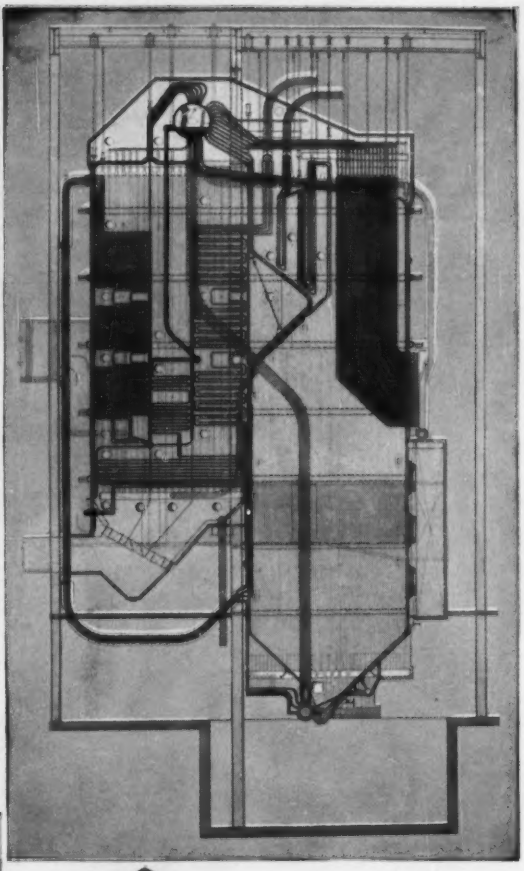
SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

LUBRICANTS • FUELS • CUTTING FLUIDS • WAXES • SOLVENTS • PLASTICIZERS • PETROCHEMICALS



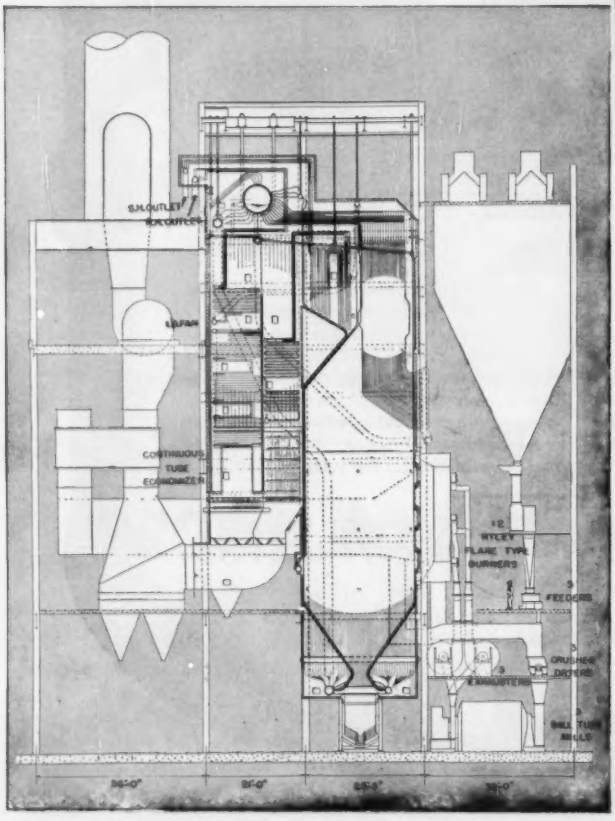
50,000 Kw

Central Louisiana Electric Co.
Teche Station, Baldwin, La.
Capacity 350,000 lbs/hr; 1500 psig; 1005F/1005F
Fuel: Natural gas; Pressurized Furnace



75,000 Kw

Florida Power Corp.
Ellaville, Florida
Capacity 600,000 lbs/hr; 1550 psig; 1000F/1000F
Fuel: Oil and Future Coal; Pressurized Setting



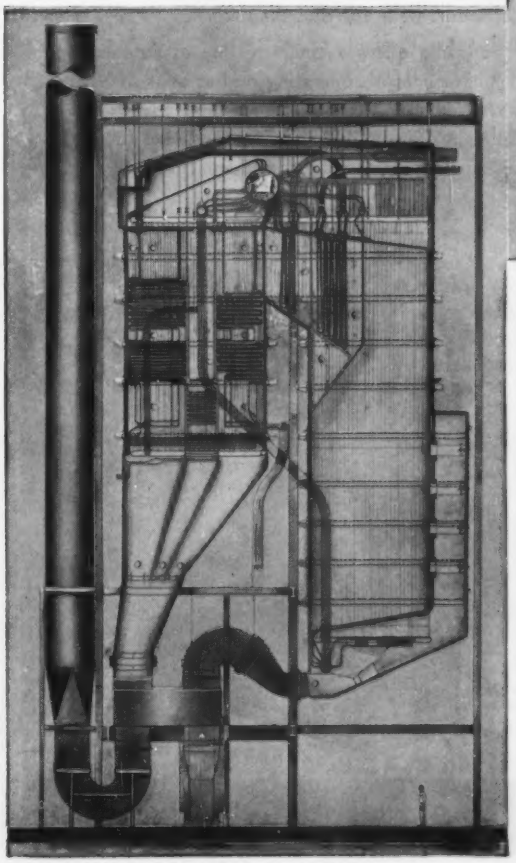
100,000 Kw (Not illustrated)
Central Illinois Light Co.
R. S. Wallace Station, E. Peoria, Illinois
Capacity 690,000 lbs/hr; 1650 psig; 1000F/1000F
Fuel: Pulverized Coal

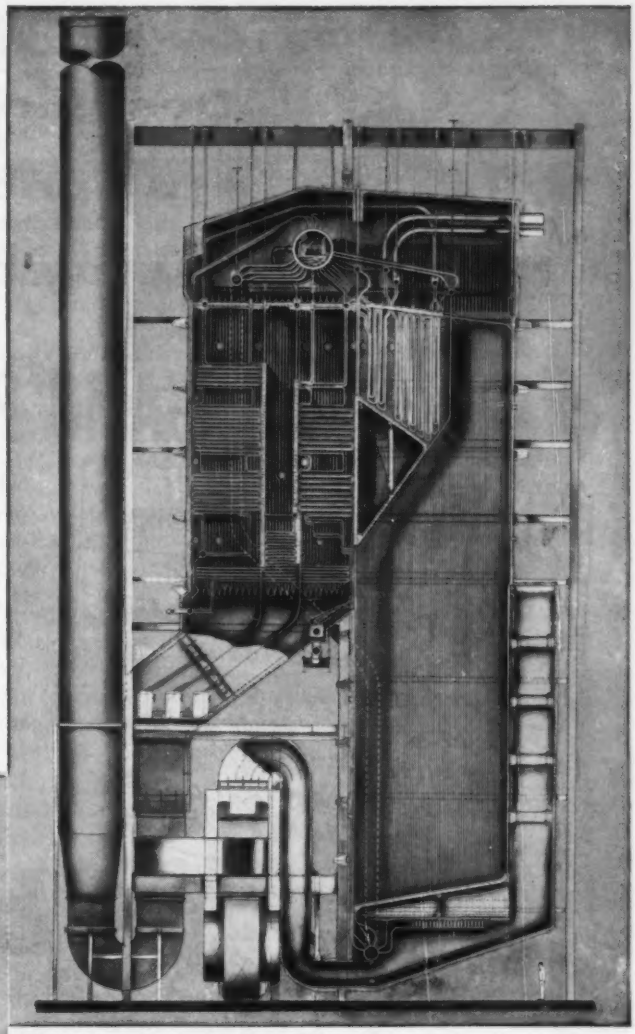
125,000 Kw
Public Service Co. of Indiana, Inc.
Wabash River Station
Capacity 805,000 lbs/hr; 2075 psig; 1005F/1005F
Fuel: Pulverized Coal

150,000 Kw (Not illustrated)
Public Service Co. of Indiana, Inc.
New Albany Station, (2 units-total-300,000 Kw)
Capacity 1,000,000 lbs/hr; 2075 psig; 1005F/1005F
Fuel: Pulverized Coal

125,000 Kw
Louisiana Power & Light Company
Nine Mile Point Station.
1,000,000 lbs/hr; 1725 psig; 1005F/1005F
Fuel: Natural gas; Pressurized Furnace

RILEY
Reheat Units for Turbine Ratings from 50,000 Kw up to 175,000 Kw





175,000 Kw
Houston Lighting & Power Company
Deepwater and Sam Bertron Steam Electric Stations
Capacity 1,250,000 lbs/hr; 2125 psig; 1005F/1005F
Fuel: Natural gas; Pressurized Furnace

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

RILEY
Stoker Corporation
WORCESTER, MASSACHUSETTS

Sales Offices: Worcester, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Houston, Denver, Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.

Designed and built to specifications you might have written...

SANGAMO POWER CAPACITORS

Power Capacitor Specifications

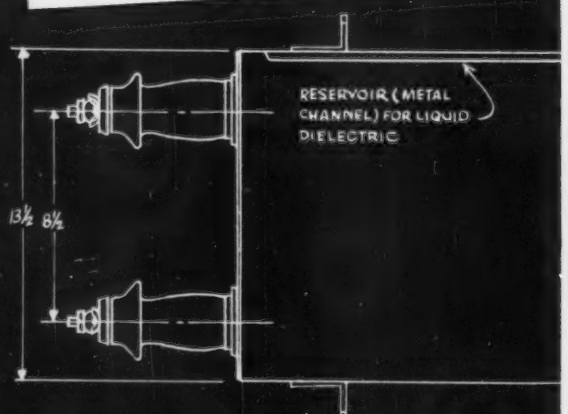
1. Corrosion protection – even though case finish is scratched.
2. Solder-sealed porcelain bushings.
3. Reliable performance at low ambient temperature.
4. Suitable for vertical or horizontal mounting.
5. Low losses.
6. Low temperature rise.
7. Stability under all operating conditions.
8. Terminal connectors for either copper or aluminum.

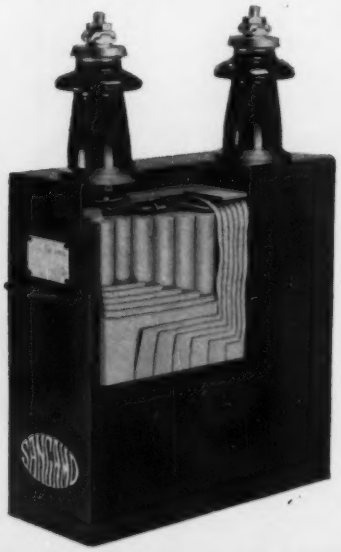
When Sangamo engineers were designing "the power engineer's capacitor", many utility men told them they wanted capacitors that could be mounted either vertically or horizontally.

Sangamo Power Capacitors can be mounted in either position. A metal channel provides a reservoir for the dielectric liquid, so when the unit is mounted with the nameplate up, full insulation to the case is retained—even in the coldest weather. If you want more details on the Sangamo Power Capacitor, write for Bulletin 1120.

Sangamo offers a complete line of automatic capacitor controls operating on the basis of Amperes, Volts, Watts, Vars, and Time. Investigate Sangamo Lincolntrols and Time Switches for the best application of your power capacitors.

PC56-1





SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

ELECTRICAL BUSINESS OUTLOOK

Electrical World
JANUARY 23, 1956

Outlook fair for slight loosening of raw materials supply. Prices generally will edge upward. Lower automobile production this year could free some metals for other uses such as electrical equipment and materials.

Copper prices likely to remain firm. Experts see little excuse for increase, no reason for decrease. Any broadening in demand for copper products could offset additional supply which is becoming available. Labor situation in industry is becoming more stable.

More steel price boosts are coming. Those in recent months have resulted from higher costs for scrap and extras, but mid-year labor hikes bid fair to raise price of pig iron. Capacity expansions are on the way. Auto industry takes about 20% of steel output in year like 1955, less this year if auto production slackens.

Aluminum prices to continue upward. Planned capacity additions during next three years will boost aluminum output by 40%. But even this is unlikely to balance new and expanding markets for the light metal.

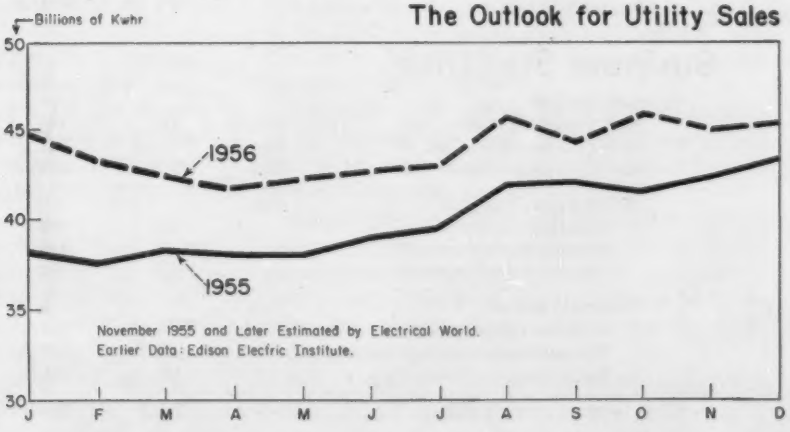
Nickel prices to fluctuate with demands even though minimum prices will hold firm. Situation is that one big producer in field holds minimum steady at 64½¢ lb, but others are selling nickel at prices up to four times that amount. Some expansion of production slated to come in this year and next but not enough to meet sharp rise in demand.

• • •

Telecasts of political conventions will spur TV set sales. That's the opinion of Philco Corp Pres James H. Carmine and others in the industry. They recall that the 1952 convention telecasts marked era of TV's greatest growth and believe history may repeat. Convention telecasts could be big factor in rosy predictions for color TV sales. Dealers and manufacturers expect to sell 250,000 to 300,000 color sets this year compared with a meager 40,000 last year. At 400 w per set in use 400 hours per year, these would mean 40 to 48 million kwhr per year in utility power sales.

Utility sales estimates, below, show gain of 17.5% for January over same month last year. Seasonally adjusted output index for first week in year shows gain of 16.8% over first week of last year.

The Outlook for Utility Sales



STATISTICS

Estimated Average Annual Kwhr Consumption of Appliances Under Normal Use

(Based on 1955 Average Wattages)

	Watts	Kwhr/year		Watts	Kwhr/year
Air Conditioner (window)	940	980	Humidifier	50	126
Bedcovering, automatic	180	124	Incinerator	610	634
Broiler	1,335	97	Iron (hand)	1,000	129
Clothes Dryer	4,455	691	Ironer (mangle)	1,495	146
Dehumidifier	210	273	Range	10,910	1,192
Dishwasher (with heat unit)	1,165	310	Refrigerator	205	353
Fan (attic)	370	251	Roaster	1,310	214
Food Freezer	270	752	Television	275	297
Frying Pan (automatic)	1,160	157	Water Heater	2,430	3,576
Heat Pump	6,055	15,673	Washing Machine (automatic)	300	48

Source: Edison Electric Institute

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Nov.	113.55	112.13	101.11	12.3
Peak—Class I Systems (million kw)	Oct.	90.6	90.1	79.9	13.4
Estimated Dec. '55 Peak (million kw)	Oct.	96.72	96.82	96.21	0.5
Estimated Dec. '56 Peak (million kw)	Oct.	104.34	104.31	102.85	1.4
Production—billion kwhr	Nov.	47.76	47.37	40.21	18.8
Hydro		9.21	8.77	8.11	13.6
Fuel		38.54	38.60	32.10	20.1
Sales—billion kwhr	Oct.	43.16	43.51	36.18	19.3
Residential		10.33	10.58	9.36	10.4
Commercial		6.87	7.36	6.32	8.7
Industrial		23.45	22.84	18.14	29.3
Other		2.51	2.72	2.36	6.4
Fuel Consumption	Nov.				
Coal—million tons		13.29	12.70	10.70	24.2
Oil—million barrels		7.10	6.04	5.82	22.0
Gas—billion cu ft		82.26	104.75	88.40	−6.9
Net Income Class A & B Co's—$ million	Oct.	95.67	100.23	86.80	10.2
Residential Customers—millions	12 mos. ended Oct. 31	44.21	44.10	42.94	3.0
Revenue per kwhr		2.65¢	2.66¢	2.70¢	−1.9
Avg kwhr per customer		2,715	2,698	2,513	8.0
Avg annual bill		$71.95	$71.77	$67.85	6.0

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Nov.	144	143	128	12.5
ENR Construction Cost	Nov.	141.1	141.2	134.7	4.8
BLS Cost-of-living	Nov.	115.0	114.9	114.6	0.3
NEMA Sales	Nov.				
Insulation materials		155	156	124	25.0
Electric appliances		106	118	90	17.8
Household refrigerators		65	64	47	38.3
Wholesale prices	Nov.				
Motors and generators		127.0	125.2	121.7	4.4
Transformers and regulators		129.2	129.2	128.1	0.9
Switchgear and fuses		146.2	146.1	135.3	8.1
GNP—annual rate—$ billion	3rd Qtr.	392.0	384.8	358.8	9.3

Your Business

This month marks the start of the celebration of the 250th anniversary of the birth of Benjamin Franklin. Although he was a statesman, his pioneering work in electricity is a matter of record. And he is also remembered as a philosopher. His Poor Richard's Almanac has been quoted through the years.

In preparation for a souvenir edition of the almanac, N. W. Ayer & Son, Inc, has prepared an ad in Franklin's style with this advice for businessmen:

"He who follows the leader can come in no better than second.

"While it is doubtless more desirable to be safe than sorry, it is also easy to be both.

"A formula, carefully followed, always gives the same answer, but it may not be the correct one.

"The employee who always agrees with your proposals will also agree with your mistakes.

"If you try to do the job of your subordinates, perhaps you are best fitted to be one.

"He who keeps stealing credit from others may, in the end, find there is nothing left to take.

"To be cynical, in business or in other activities, is seldom a protection against being deceived by others, and never a protection against deceiving one's self."

The 1955 editions of almanacs of another kind have just been issued. For those who want to be well-equipped for business, enjoyment, or arguments, the World and Information Please Almanacs are two of the most comprehensive, handiest, and, at $1 apiece, least expensive sources of information available.

Do you need to know the name of a Congressman; the address of an association or society such as AIEE, EJC, EEI, etc? Do you know how to make a will, or do you want to check on rules of parliamentary procedure? The answers are all in these almanacs.

We in the industry are much concerned with weather. Information Please will tell you how it is made, how to read a weather map, and provide you with many weather statistics. For load forecasters there is a wealth of vital statistics and economic data. We can all find something valuable in these books.

"Yeah, you can use your electric shaver."

Your Health

REX H. WILSON, Medical Director, B. F. Goodrich Co

The way to avoid a cold is to stay away from those who have one. At least we can try to stay away from the "sneezers."

Actually you do not know if you have a cold until you are over it. Several diseases have similar symptoms. Almost everyone recovers from a cold in a few days. Rest and mild medication, such as aspirin or the antihistamines, usually relieve the symptoms. The antibiotics are of no value. "Cold vaccines" are effective in some people.

The common cold will cost industry over $1.5 billion this year. And this, by a virus so small that it can be seen only through a microscope.

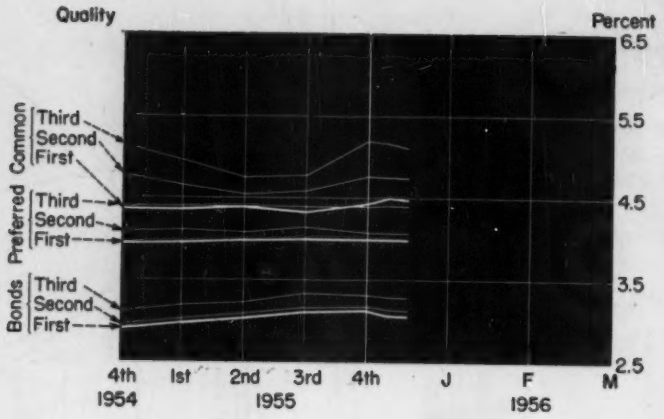
A "cold" is an acute or chronic infection of the nose, throat, and lungs. It spreads rapidly. A "stuffy" nose today may be sinusitis, sore throat, or bronchitis tomorrow. It can occur anywhere at any time.

The cold virus can be dispersed by sneezing or by blowing the nose. It remains contagious for about five hours. It can be spread by contaminated hands, and eating utensils.

Early symptoms of a cold are mild nasal irritations, sneezing, and tiredness. Later, fever, generalized aching, loss of appetite, and fatigue may occur. A burning sensation develops in the nose and throat along with a watery nasal secretion.

Why settle for 50 years when you could have 100?

Today's Utility Yields (%)



QUALITY	BONDS			PREFERRED STOCKS			COMMON STOCKS		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Jan. 12	3.07	3.12	3.26	3.98	4.08	4.39	4.49	4.75	5.11
Jan. 5	3.08	3.13	3.28	3.98	4.08	4.40	4.50	4.76	5.16

Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Central Maine Power	11	Nov.	$6,226,211	$5,352,976	$....	$....
El Paso Electric	12	Nov.	2,058,705	2,196,786	2.30	2.48
Kansas City Power & Light	12	Nov.	7,777,147	7,115,410	2.35(a)	2.34(a)
Montana Power	12	Nov.	8,541,661	7,583,882	2.95	2.61
Tampa Electric	12	Nov.	3,337,158	2,878,093	1.34(b)	1.33(b)
Utah Power & Light	12	Nov.	6,783,339	5,763,814	3.06	2.82

Notes—(a) Based on 2,695,000 shares in 1955 and 2,450,000 shares in 1954, and (b) Based on 2,172,855 shares in 1955 and 1,975,323 shares in 1954.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
SCHEDULE FOR JANUARY—FEBRUARY—MARCH			
BONDS			BID DATE
Central Power & Light—1st mtg due 1986	$10,000	.....	Feb. 14
Pennsylvania Electric—1st mtg due 1986	25,000	.....	Feb. 15
Dallas Power & Light—1st mtg due 1986	10,000	.....	Feb. 15
Kansas Gas & Electric—1st mtg due 1986	7,000	.....	Feb. 27
Texas Electric Service—1st mtg due 1986	10,000	.....	Feb. 28
Mississippi Power—1st mtg due 1986	4,000	.....	Mar. 1
Alabama Power—1st mtg due 1986	14,000	.....	Mar. 15
Georgia Power—1st mtg due 1986	16,000	.....	Mar. 29
PREFERRED STOCK			
Pennsylvania Electric—90,000 sh	$9,000	.....	Feb. 15
Mississippi Power—40,000 sh	4,000	.....	Mar. 1
Southern California Edison—up to 1,200,000 sh	.....	.....	.....
COMMON STOCK			
Texas Utilities—400,000 sh	.....	.....	Jan. 31
Atlantic City Electric—75,000 sh	.....	.....	Feb. 1
Southern Indiana Gas & Electric—83,030 sh (to be offered commonholders on 1-for-11 basis, record Feb. 21 to expire Mar. 8, with no oversubscription privileges)	.....	.....	.....
Kansas Gas & Electric—200,000 sh	.....	.....	Feb. 27

FINANCIAL BRIEFS

Tacoma, Wash., Public Utilities Board has delayed for three weeks the sale of a $5 million City Light revenue bond issue. Originally scheduled for Jan. 10, the opening of bids now is scheduled for Jan. 31.

Newfoundland Light & Power Co has sold $1.5 million first mortgage 4% sinking fund bonds due 1975 to the public at 98. The offering was made through Royal Securities Corp.

Long Island Lighting Co arranged $32 million revolving credit plan with 21 local banks to take care of temporarily the 1956 construction program.

Wisconsin Public Service Corp will pay Mar. 20, a quarterly common stock dividend of 30¢ a share as compared with 27½¢ a share in the previous quarter.

REGULATION BRIEFS

Texas Power & Light Co has won a first reading in the City Commissioners Council to increase rates 2.8% a year in Tyler, Tex.

Citizens Electric Co, Lewisburg, Pa., has asked the Pennsylvania Public Utility Commission approval to lower rates of residential water heating customers by $1,714 a year.

Rhode Island legislature has received a resolution from Sen Ralph T. Lewis, Warwick Republican, proposing an investigation of the state's electric, gas, telephone, and water rates.

Arkansas Power & Light Co has been ordered by the Arkansas Supreme Court to increase from $2 million to $7.5 million a bond guaranteeing refunds to customers of increased rates which the company has been charging since July 1, 1954.

New York State Legislature has received a bill to add a new section to the Public Service Law to give the public service commission supervision over electric and gas sub-metering corporations and to require that other business be kept separate in accounting records.

CURRENT TRANSFORMERS from 200 to 4000 amperes, 600 volts and below for indoor or outdoor use

TYPE BKM
for 1200 and 1500-ampere use has an opening 4¼" high, 1¾" wide for the primary conductor.
TYPE TWM
is available in 200, 400, 600 and 800 amperes, with intermediate ratings obtainable by passing the primary conductor through the 1⅜" x 2¾" opening more than once.
TYPE BKM
for 2000, 3000 and 4000-ampere application has large 4¼" square opening for primary conductor

Completely Molded in Thermo-setting Resin

No Maintenance

Maintenance is eliminated on all Allis-Chalmers service-proved molded current transformers. They are molded in a thermo-setting resin with an inherent toughness which assures long life and resistance to all kinds of weather. The molded resin serves as insulation, support and casing for the transformer.

Only secondary terminal inserts and base mounting inserts protrude from the molded body. A perfect seal is established because of the excellent adhering qualities of the resin.

Tests Prove Fire Safety

Allis-Chalmers molded current transformers will never be a fire hazard. Tests prove they will not support combustion or add to a fire's intensity — an important thing to look for in a current transformer.

Designed for Versatile Installation

You can mount these transformers in any position. Bases of all nuts can be removed to mount on any convenient flat surfaces — bars, channels, walls, etc., with ⅜" bolts. Bases of Type TWM units can be rotated.

A removable short-circuiting device and sealable secondary terminal cover are standard on all units. A conduit box can be substituted for the secondary terminal cover. For all units 1500 amperes and below there is available a "Do-It-Yourself" conversion kit to change over to a 5000-volt bar-type unit.

Get complete information. See your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin. A-4876

ALLIS-CHALMERS

PORTABLE PROTECTION ...by DE LAVAL

Miller Electric Co., of Jacksonville, Fla. purify and reclaim insulating oil for a number of power companies on contract . . . have to do a flawless job because one oil failure might lose a customer.

To insure the best possible oil maintenance service, Miller Electric's President James Dandelake designed an ingenious special trailer . . . a completely integrated portable oil purifying outfit, *the heart of which is a 150 g.p.h. De Laval Insulating Oil Purifier.*

And . . . Mr. E. L. Scott, Miller engineer, writes—"The unit has been working perfectly."

For any insulating oil problem, there is one right answer—De Laval! Get all the facts . . . write *now* for Bulletin TR-1.

DE LAVAL
insulating oil purifiers

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • DE LAVAL PACIFIC CO. 201 E. Millbrae Ave., Millbrae, Calif.

Photo shows installation of an L-M Type PVH 600 ampere switch on 34,500 volt line at Cedar Rapids by Iowa Electric Light & Power Company. Linemen on the structure are, left to right, John Engledow, Stanley Andrle, and Harley Squires. With his back to camera is L-M Field Engineer Ralph Hamer.

Iowa EL&P Installs L-M PVH Switches To Cut Sparkovers on Lightning Surges

by
HOWARD K. HOLLINGSHEAD
District Operating Mgr.
Iowa Electric Light
& Power Company

The photograph shows the installation of an L-M type PVH air break switch on our lines at Cedar Rapids. The new switch replaced an older switch on a point in the lines that is operated "normally open."

The former switch operated satisfactorily as a normally closed switch, but on normally open service the inadequate clearance caused line tripouts and switch insulator damage caused by lightning surges during thunderstorms. During the summer of 1954, eight of the nine insulators on the old switch were damaged.

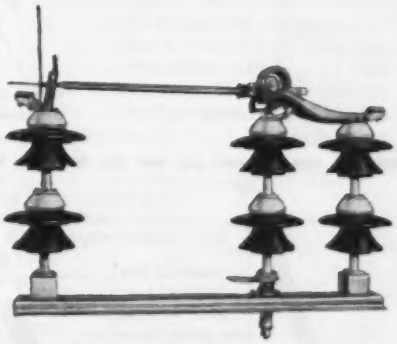
We expect that the new PVH switch has ample clearance and thus will eliminate the trouble. As additional assurance against surges piling up and spilling over, arresters have been installed on each side of the switch one span away.

Since it was not practicable to de-energize the circuits joined at this point during installation time, they were dead-ended temporarily on the single pole shown at the right of the photograph, while the switch is being installed on existing poles.

The new L-M switch is being installed under the supervision of Crew Foreman Howard Norris. He and all the members of the crew were particularly pleased by the rugged simplicity of the PVH switch and the ease of assembly and adjustment. He particularly liked the identification of the interphase bars and the foolproof method of installing them.

Get This Bulletin For Complete Information

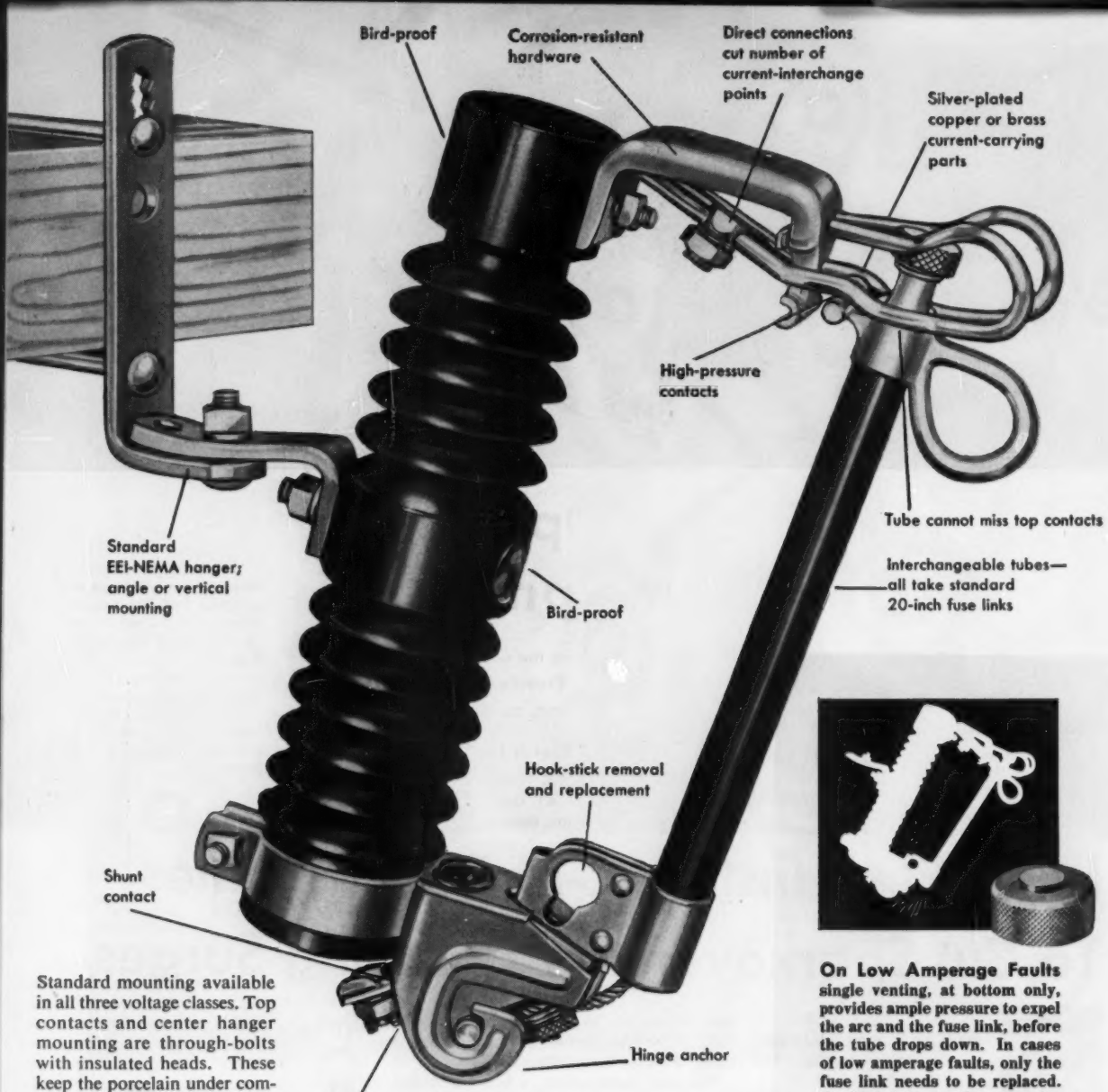
L-M offers a complete line of vertical air break and hook switches through 1200 amperes and 69 kv. For information and bulletin ask the L-M Field Engineer; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



L-M type PVH switches offer ample clearances; castings of aluminum bronze alloy which make them exceptionally strong and light; and the design provides a powerful lever advantage to assure positive operation regardless of ice, corrosion, or long periods of non-operation.

240

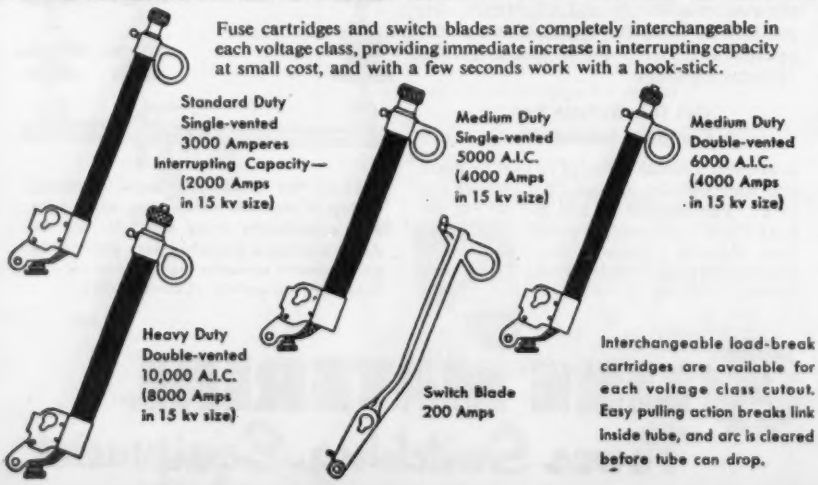
LINE MATERIAL
Power Switching Equipment


Bird-proof
Corrosion-resistant hardware
Direct connections cut number of current-interchange points
Silver-plated copper or brass current-carrying parts
High-pressure contacts
Tube cannot miss top contacts
Interchangeable tubes—all take standard 20-inch fuse links
Standard EEI-NEMA hanger; angle or vertical mounting
Bird-proof
Hook-stick removal and replacement
Shunt contact
Hinge anchor
Direct connections cut number of current-interchange points

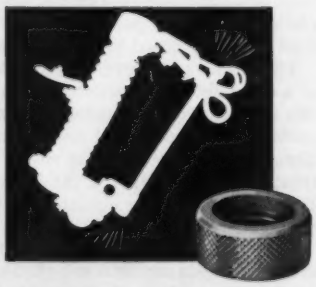
Standard mounting available in all three voltage classes. Top contacts and center hanger mounting are through-bolts with insulated heads. These keep the porcelain under compression, providing added strength and a completely bird-proof design.

On Low Amperage Faults single venting, at bottom only, provides ample pressure to expel the arc and the fuse link, before the tube drops down. In cases of low amperage faults, only the fuse link needs to be replaced. On high interrupting capacity cutouts, the expendable cap, above, right, remains intact, the same as the solid cap.

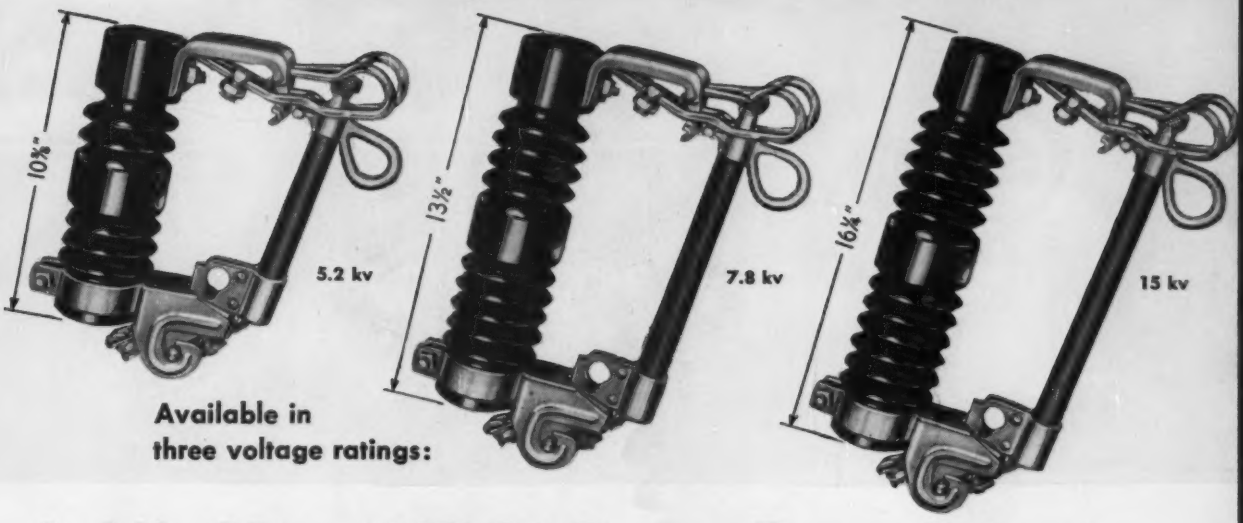
Fuse cartridges and switch blades are completely interchangeable in each voltage class, providing immediate increase in interrupting capacity at small cost, and with a few seconds work with a hook-stick.


Standard Duty Single-vented 3000 Amperes Interrupting Capacity— (2000 Amps in 15 kv size)
Medium Duty Single-vented 5000 A.I.C. (4000 Amps in 15 kv size)
Medium Duty Double-vented 6000 A.I.C. (4000 Amps in 15 kv size)
Heavy Duty Double-vented 10,000 A.I.C. (8000 Amps in 15 kv size)
Switch Blade 200 Amps

Interchangeable load-break cartridges are available for each voltage class cutout. Easy pulling action breaks link inside tube, and arc is cleared before tube can drop.



On High Amperage Faults pressure opens expendable cap at top. Tubes don't burst. No gas flashover, because no cutout parts are in path of gas discharge.



Available in three voltage ratings:

L-M's New "HDO" Open-Type Cutouts... The Cutout Development Of The Year!

New "HDO" 100-ampere cutouts are the simplest, most rugged, easiest to operate in the industry today. Provide high interrupting capacity, bird-proof design; heavy construction, assuring economy.

By R. W. KELLY
Application Engineer
Protective and Switching Equipment Division
Line Material Company

Here's a big new development in open-type cutouts that offers you a tremendous improvement in performance, operation, and economical long life.

The "HDO" is a big, rugged cutout. It is strong, durable. It's the easiest cutout to operate you ever saw. Complete hook-stick removal and replacement of cartridges. Bird-proof construction. Silvered current-carrying parts with few current-interchange points assure ample capacity without overheating. And it operates equally well on high and low fault currents.

Positive Pressure Control

A feature of the "HDO" is L-M's exclusive pressure-controlled expendable cap. On low faults the pressure is confined, assuring consistent, reliable arc interruption. On high faults the diaphragm in the cap opens, relieving the pressure by providing double venting.

Complete Line of Cutouts

Prices for the "HDO" cutouts are extremely reasonable, and the interchangeability feature offers desirable future economies. The complete line includes cutouts in the 5.2, 7.8, and 15 kv classes, with a full line of cartridges in standard- and heavy-duty interrupting ratings, and a 200-ampere switch blade. All cartridges take standard 20-inch distribution fuse links.

Protection That Is Reliable

The many desirable features incorporated in L-M's "HDO" open-type cutout assure positive action, dependable service.

Completely bird-proof construction.

Current-carrying parts all silver-plated brass or copper; this prevents false outages caused by contact heating even after many years of operation.

Cartridge firmly anchored for closing-in on faults; tube cannot move upward; cannot pop out of bottom hinges in closing.

All cartridges are designed for complete removal and replacement with a standard hook-stick.

Maximum interrupting capacities with any size link. Cutout interrupts any fault current from minimum melting of link to maximum cutout rating.

Connectors mounted directly on stationary contacts eliminate several current-interchange points.

Tube cannot miss top contacts, which are heavy silver-plated springs and designed to serve as a guide.

Corrosion-resistant, high-strength hardware has four to six times the life of mild steel.

Get Complete Information

Ask the LM Field Engineer for complete information about L-M's complete line of open and enclosed fuse cutouts and other protective equipment. Or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

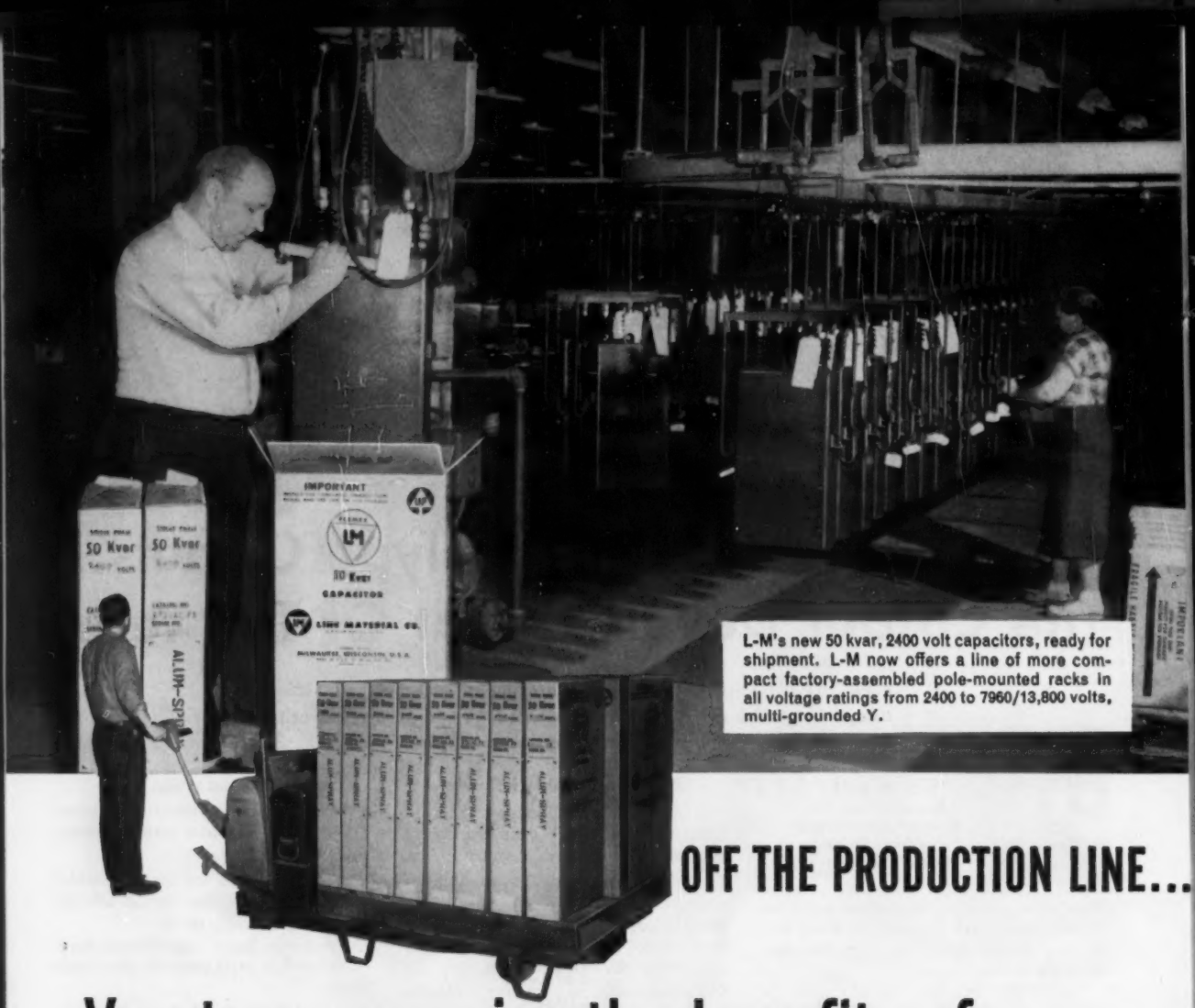
SIZES AND RATINGS

Cartridges	Interrupting Capacity, Amperes 5.2 kv.	7.8 kv	15 kv
Standard Duty Single Venting (Solid Cap)	3000 A.	3000 A.	2000 A.
Medium Duty Single Venting (Solid Cap)	5000	5000	4000
Medium Duty Double Venting (Expendable Cap)	6000	6000	4000
Heavy Duty Double Venting (Expendable Cap)	10,000	10,000	8000
Switch Blade	200 amperes continuous		

All cartridges and switch blades interchangeable in each voltage class.

LINE MATERIAL
fuse cutouts and fuse links

204R-2



L-M's new 50 kvar, 2400 volt capacitors, ready for shipment. L-M now offers a line of more compact factory-assembled pole-mounted racks in all voltage ratings from 2400 to 7960/13,800 volts, multi-grounded Y.

OFF THE PRODUCTION LINE...

You, too, can enjoy the benefits of L-M's **New 50 kvar** Capacitors NOW

Shipments have started on Line Material's new 50 kvar Elemex Capacitor. The unit is an outstanding achievement in capacitor engineering and production. It has the same width, same thickness as a 25 kvar capacitor. Only ten inches of additional height give you twice the capacity.

Per kvar, L-M's new 50 kvar capacitor is lighter, requires less pole space, and takes less installation time. Thus, installed cost per kvar is lower. It meets applicable NEMA standards for 25 kvar capacitors.

Ask the L-M Field Engineer for information on features, design and delivery of the new 50 kvar capacitor and capacitor equipments. Or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

LINE MATERIAL

Elemex® Capacitors

Ring is cut away as reminder to linemen that he should break the link before opening the cutout.

Complete hook-stick removal and replacement of cartridge. Available in 5.2 kv, 7.8 kv, and 15kv voltage ratings.

Easy pulling action of interchangeable load-break cartridge will break link inside tube, and arc is cleared before tube can drop.

Less than 30 lbs. pull to break the largest size link . . .

Interchangeable Load-Break Cartridge Now Available for L-M's HDO Open-Type Cutouts

Load current is extinguished in the tube. Load-break interrupts all capacitive and inductive loads up through 100 amperes. Fault interrupting capacity 10,000 amperes, 5.2 kv, 7.8 kv, and 8,000 amperes, 15 kv.

By **GEORGE W. COOPER,**
Product Manager
Protective and
Switching Equipment
Line Material Company

L-M's big, rugged 100-ampere HDO open-type cutouts with the new interchangeable load-break cartridges provide outstanding operating and design features that assure you of lasting performance and easy operation.

The load-break cartridge utilizes standard 20-inch distribution fuse links. All links through 100 amperes can easily be broken because of the high mechanical advantage of the link-break lever.

A pulling action of less than 30 pounds is required to break the largest size link. The cartridge is designed to insure a complete break of the fuse link and the complete extinguishing of load current in the tube.

The upper pull ring has been cut away to remind the lineman of the link-break feature. This eliminates the danger of pulling open the cutout, through force of habit, without first breaking the link. If, on second thought, it is deemed desirable to open the cutout without breaking the link, this can be done by engaging the hook stick behind the cartridge.

Principal Features of L-M's 100 Amp HDO Open-Type Cutouts

The HDO incorporates many desirable features, assuring positive action and dependable service. These include:

Completely bird-proof construction.

Corrosion-resistant, high-strength hardware, with 4 to 6 times the life of mild steel.

Current-carrying parts all silver-plated brass or copper.

Cartridge firmly anchored for closing-in on faults; tube cannot move upward; cannot pop out of bottom hinges in closing.

All cartridges designed for complete hook-stick removal and replacement.

Maximum interrupting capacities with any size link. Cutout interrupts any fault current from minimum melting of link to maximum cutout rating.

Tin-plated connectors mounted directly on stationary contacts eliminate several current-interchange points.

Tube cannot miss top contacts, which are heavy silver-plated springs. These make a high-pressure contact with the cartridge.

Positive pressure-controlled expendable cap.

Exclusive wedge-type clamping jaw positively prevents link slippage. Jaw teeth firmly grip link loader—the harder the pull, the tighter the grip.

The complete line includes cutouts in the 5.2, 7.8, and 15 kv classes with a full line of conventional and load-break cartridges in standard and heavy duty interrupting ratings, and a 200 ampere switch blade.

Get Complete Information

Ask the L-M Field Engineer for complete information about L-M's complete line of open and enclosed fuse cutouts and other protective equipment. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

219

LINE MATERIAL
fuse cutouts and fuse links

-it had to be different!

. . . to successfully eliminate the minute arcing and discharges that cause annoying radio and television interference–and to do it by a method divorced from ineffectual standard practices–**it had to be different!**

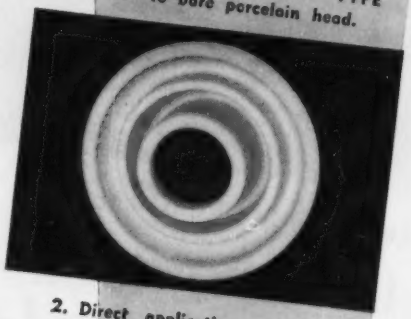
Illustrated steps as shown at the right depict the stages of application of **"TYPE N"** glaze. **NO OVERLAY, NO UNDERCOAT**—but a permanent, hard, smooth, vitreous, conductivity controlled glaze.

RESULT—a noise proof insulator without equal.

Specify Porcelain Products **"TYPE N"** glaze.

3 GLAZING STEPS

1. Direct application of "TYPE N" to bare porcelain head.



2. Direct application of "TYPE N" to bare porcelain pinhole.

3. Application of Regular Brown glaze on balance of pintype to match points as shown by arrows.

EEI-NEMA CLASS 55-4
PP #6198N

PP INC.

Porcelain Products, Inc. / **Parkersburg, West Virginia.**

Solve Construction Problems with Ebasco's winning combination of quality and versatility

In plant construction, as in chess, no two problems are exactly alike. The requirements of one industry are often radically different from those of another.

That's why, if you're thinking of building a new plant, you should think of Ebasco. Over the past 50 years, Ebasco has handled more than $2 billion of plant construction for many different companies in many different parts of the world.

We can handle every phase of the job, from selection of the site, engineering, design—right through construction and actual placing in operation of the plant.

If you are considering a new plant, write for our booklet, "The Inside Story of Outside Help," which describes the wide range of services we offer business and industry. Address Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6, New York.

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Systems, Methods & Budgets • Tax • Washington Office

GOES ANYWHERE...

TACKLES ANY JOB!

Best Digger Truck Going!

In more and more utility operations, it has become standard operating practice to depend on FWD trucks for digger work. They'll travel and work on any line job . . . as fast as any other truck. But they have a built-in reserve for emergencies . . . going and working where conventional trucks can't even travel. For the tightest traction in the roughest going . . . on any road condition, over any terrain, you'll get there faster, surer, safer with FWD digger trucks. Frames are designed to take digger twist and stress. And FWD's scientific weight distribution lets you haul more working weight on the powered front axle. For any utility line assignment, in any kind of weather, you'll give better service with less lost time, with FWD—the *best digger truck going.*

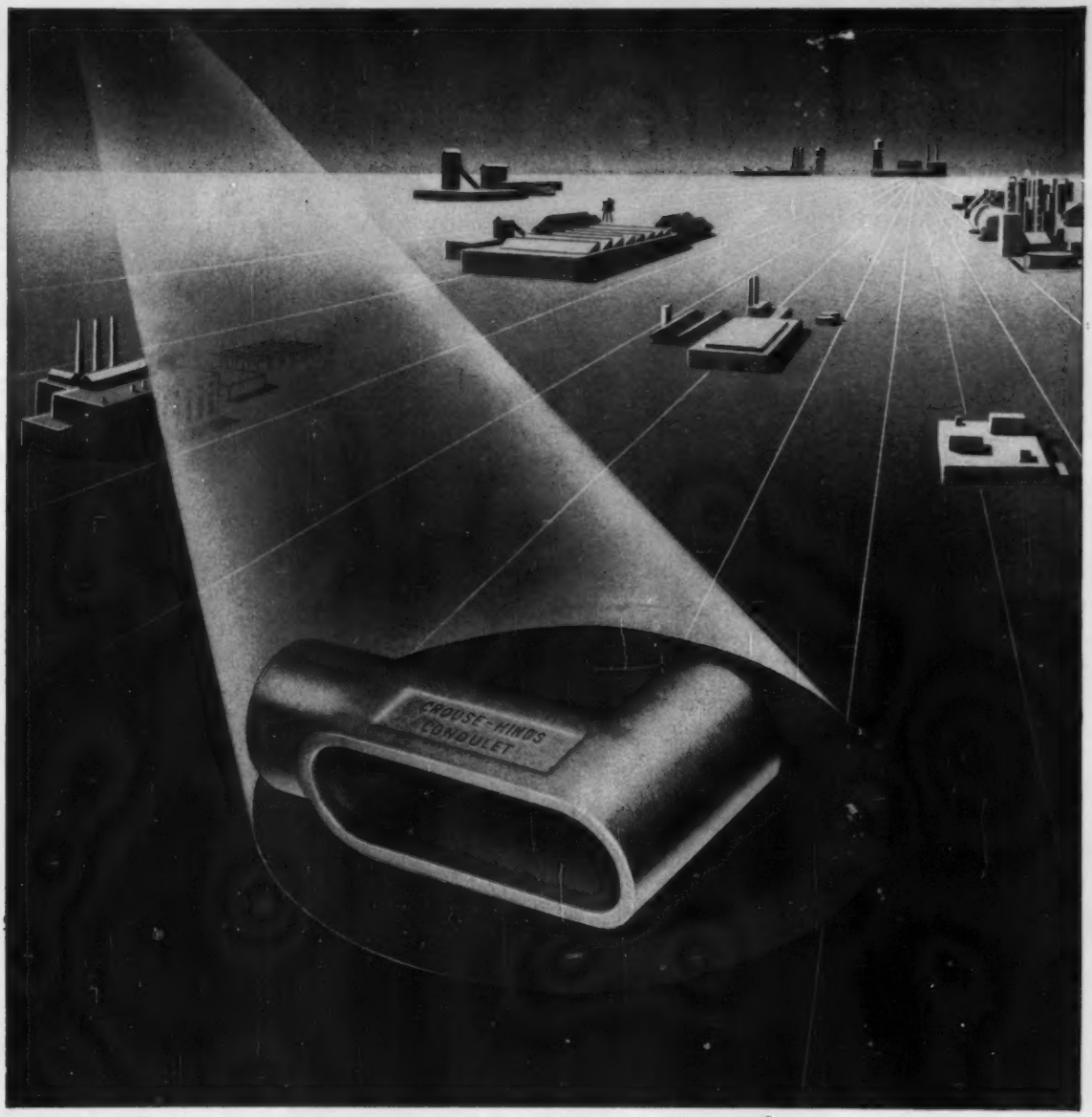
THE FOUR WHEEL DRIVE AUTO COMPANY

CLINTONVILLE, WISCONSIN • *Canadian Factory* • KITCHENER, ONTARIO

Whether you want rear diggers, or the front-mounted derrick and digger, FWD has them both in any weight you need for your own line construction and maintenance.

BUILDERS OF AMERICA'S FOREMOST HEAVY-DUTY TRUCKS

MATH-MATIC DESIGN



Still the standard of quality in rigid conduit fittings

Condulets* have been widely imitated since Crouse-Hinds introduced them more than 40 years ago . . . *and that's all to the good!*

Imitation by others has kept us on our toes . . . made us constantly improve our product to stay *ahead* of competition.

As a result, most conduit fittings today incorporate many basic features pioneered by Crouse-Hinds—but lack certain refinements that put Condulets in a class by themselves, head and shoulders above the rest.

What other fittings, for example, include these improvements:

. . . an ingenious *Cover* design that eliminates protruding screws or ears in the housing—common causes of cable damage.

. . . a longer *Hub* that permits full tightening of conduit and fitting without causing conduit to bottom on the integral bushing.

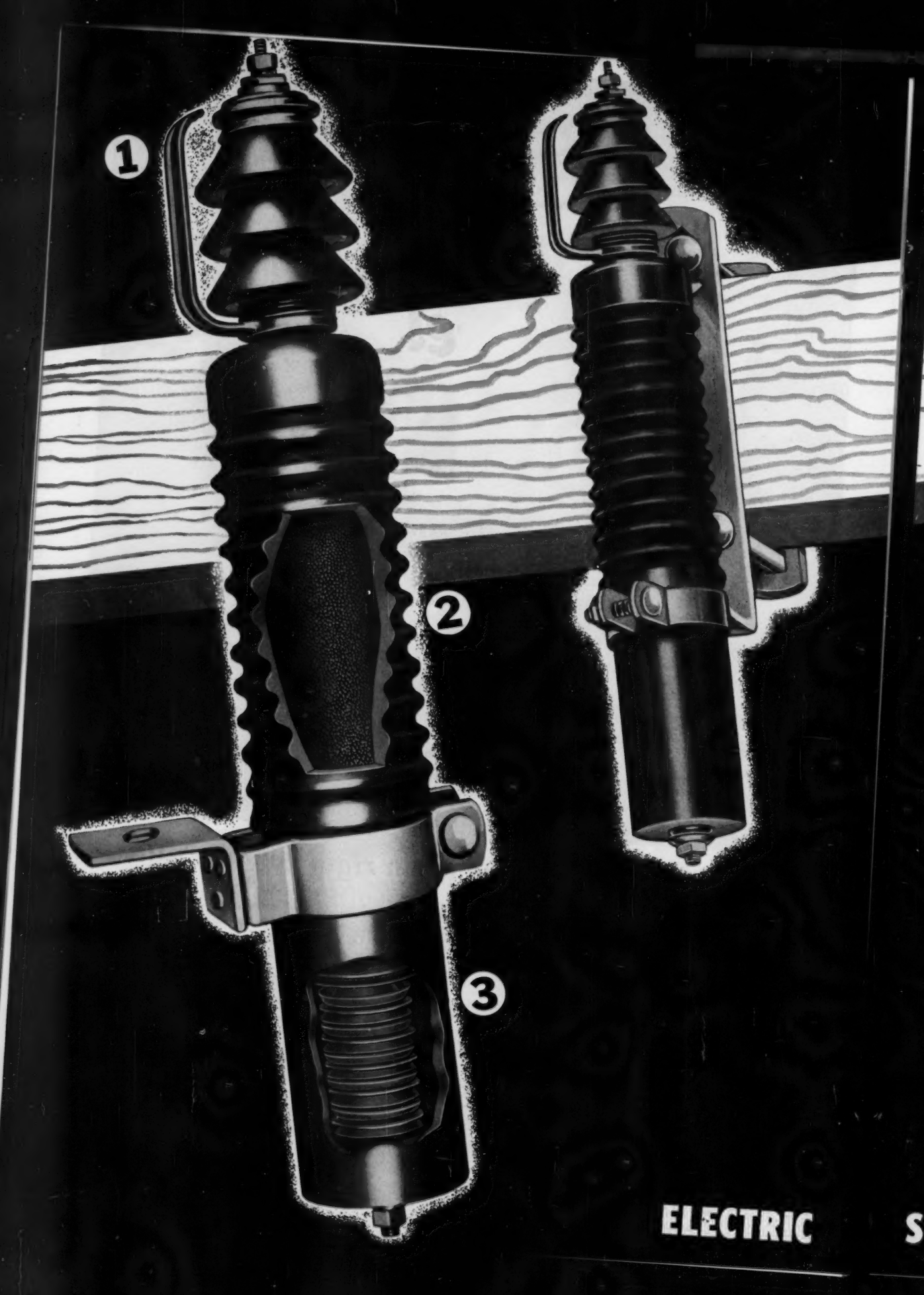
. . . a corrosion-resistant Feraloy *Body* plus a triple-layer *Finish* that exceeds Federal and UL specs. for lasting protection.

These years-ahead Condulet features have yet to be equalled. You get them in all 45 types of Obround Condulets ranging in size from ¾" to 6". See your Crouse-Hinds distributor. Crouse-Hinds Company, Syracuse 1, New York.

*Registered

CROUSE-HINDS COMPANY

CONDULETS FLOODLIGHTS TRAFFIC SIGNALS AIRPORT LIGHTING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3
ELECTRIC
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PROVIDE BEST PROTECTION
With Isolating External Gap
VALVE Arresters

These isolating external gap arresters are the result of Electric Service development and field engineers taking all of the finest service-proved features of Crystal Valves . . . putting them into one arrester . . . and adding a feature sought by thousands of utility men.

1. **The isolating external gap provides positive protection from line lockouts.**

2. **Exclusive "T" Grain Silicon Carbide valve element is unaffected by moisture or age. It has the highest thermal and surge current capacity of any valve element material.**

3. **Ultra-Speed Multiple Arcing unit, coordinated with external gap results in impulse sparkover slightly higher than the standard Crystal Valve, but below the industry average for all valve type arresters. This is true even with the arrester bracket not grounded.**

These isolating external gap Crystal Valve Lightning Arresters are available in vented or non-vented construction for both cross-arm or tank mounting. Their applications are not limited by values of surge or fault current. Write today for full details on these service-proved external gap VALVE arresters.

SERVICE MANUFACTURING CO. Philadelphia 32, Pa.

TAPE IT for durability with

USKORONA SPLICING COMPOUND
US
RUBBER
½ IN. WIDE
30 FT. ROLL
OZONE & MOISTURE
RESISTING COMPOUND
Uskorona combines maximum resistance to OZONE and MOISTURE with high tensile strength, elongation and dielectric resistance. Fuses quickly without heat or pressure and makes
PERFECT
SPLICES.
Made in U.S.A.
United States Rubber Company
USKORONA SPLICING COMPOUND

USKORONA

the only tape that resists both moisture and ozone

Uskorona tape will *not* break down. Just how rugged is this tape? Well, in a corona-(ozone) resistance test of 4 leading brands, Uskorona was the only tape still intact after 4 hours of exposure. All others broke down. Even after 1500 additional and *consecutive* hours of exposure, Uskorona remained as fresh and corona-resistant as at the start.

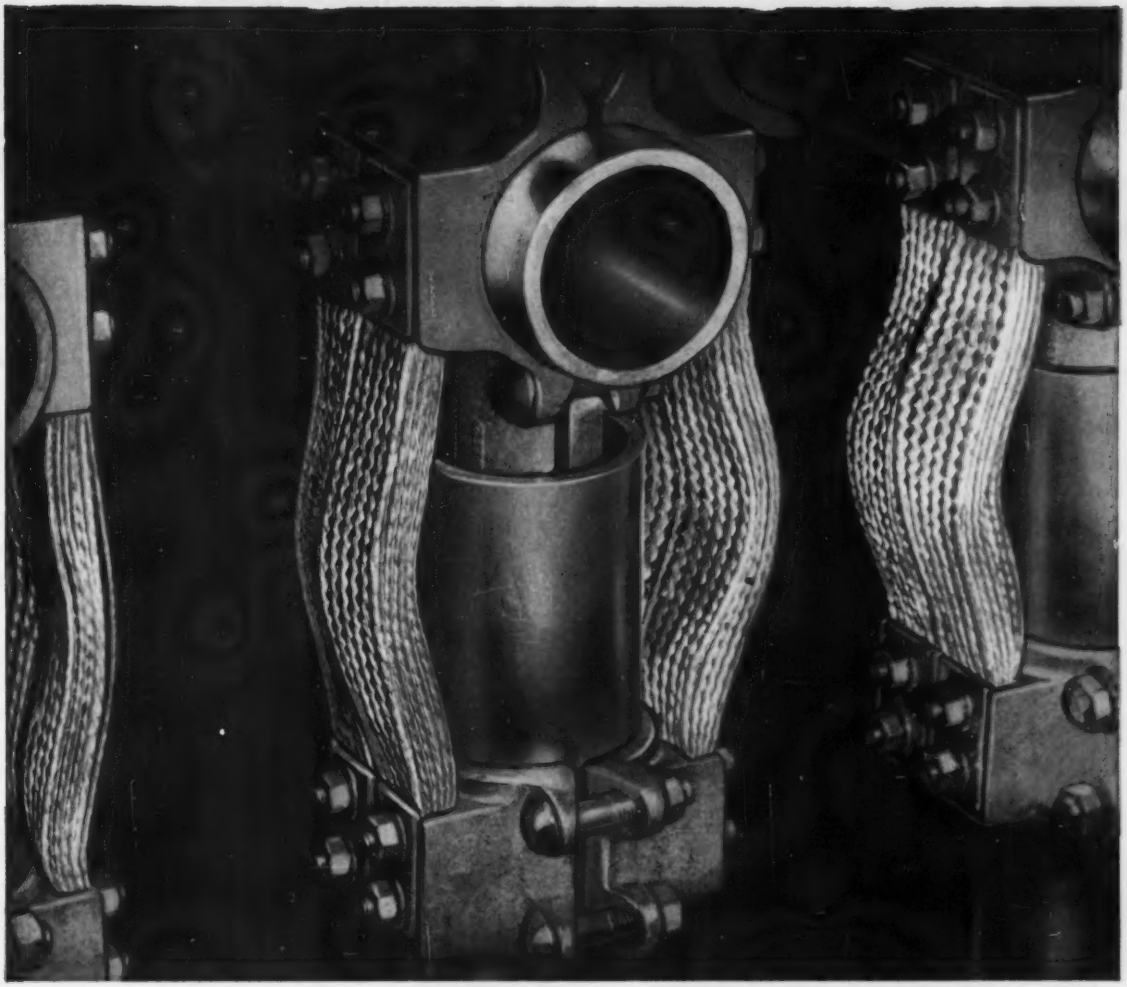
Electrical engineers insist on Uskorona in the design, installation, operation and maintenance of power lines wherever corona or moisture is a problem. Uskorona provides ideal insulation in splicing electrical cables on underground power lines, on secondary network systems, underground street lighting circuits, and transformer leads. It fuses with and becomes a part of the insulation and gives the *same* dielectric strength as the original insulation. Exceeds A. S. T. M. specifications.

Uskorona® is obtainable at any of our selected distributors, any of the 27 "U. S." District Sales Offices, or contact us at Rockefeller Center, New York 20, N. Y.

US RUBBER

Mechanical Goods Division

United States Rubber



for settling or expansion

BURNDY EXPANSION CONNECTORS ARE ELECTRICALLY BETTER THAN BUS

Even when enclosed and indoors, Burndy flexible connectors carry the full load of the bus without overheating—will run cooler than bus *even on overloads.*

Burndy flexible expansion connectors provide a wide safety factor under the most rigorous operating conditions. Design considerations take into account all geometrical, mechanical and electrical factors—not merely conductivity constants of flexible braid. They include end effect, skin effect, radiation as a function of total surface area, and mutual heating in relation to ventilation and position of connector parts.

The result is a line of expansion connectors—TEES, COUPLERS, ELBOWS, STUD CONNECTORS, BUS SUPPORTS—for all conductors and all applications indoors and out—connectors you can rely on to carry the heaviest loads without trouble or failure.

For catalog or engineering reference sheet with full information on bus expansion, get in touch with your Burndy Representative, or write direct to "connector headquarters": BURNDY—Norwalk, Connect.; Toronto, Canada. *Factories:* New York, California, Toronto. *Export:* Philips Export Company.

It's good business to connect with . . .

BURNDY

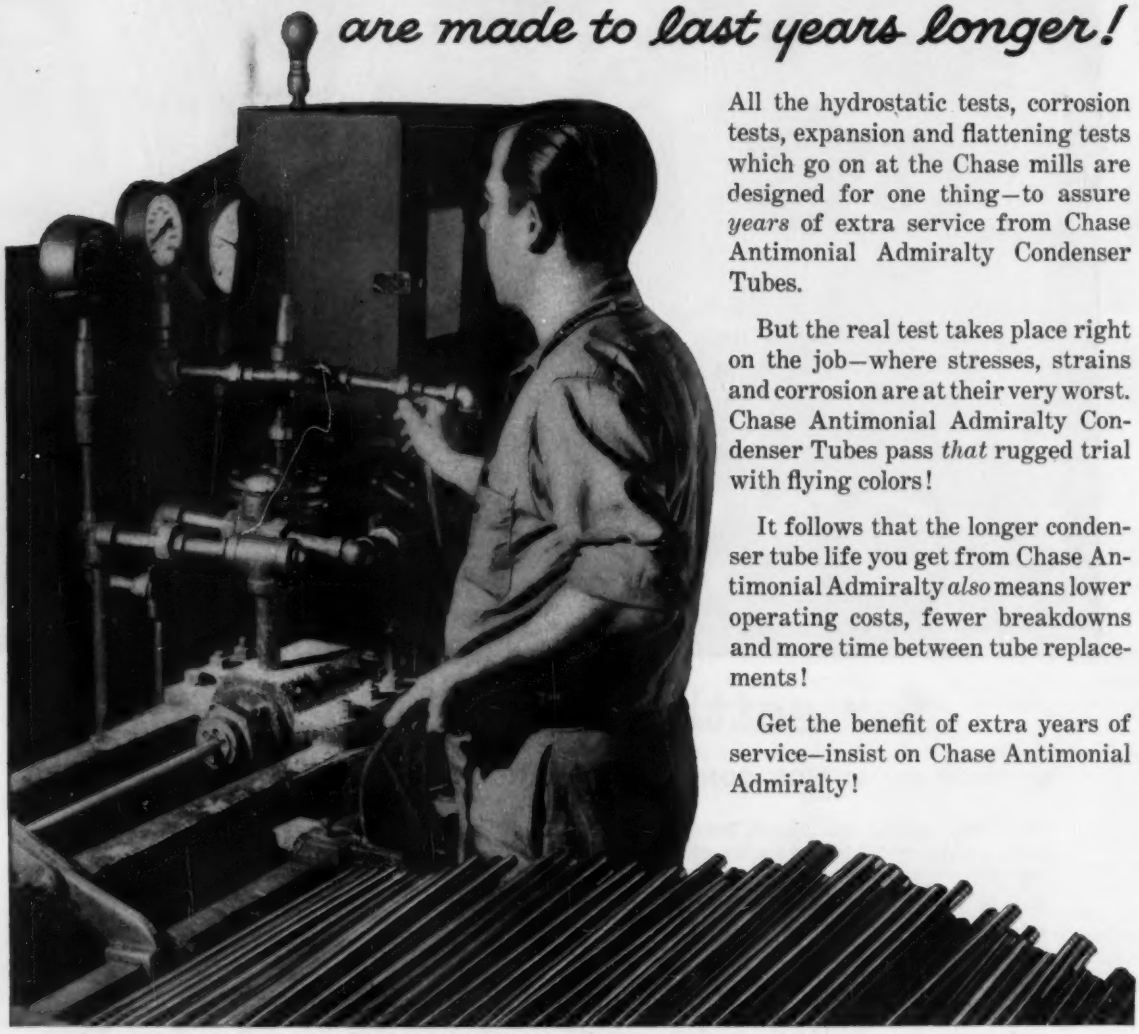
54-30

. . . FIRST name in electrical connectors; tools; methods

PRE-TESTED!

CHASE® ANTIMONIAL ADMIRALTY CONDENSER TUBES

are made to last years longer!



All the hydrostatic tests, corrosion tests, expansion and flattening tests which go on at the Chase mills are designed for one thing—to assure *years* of extra service from Chase Antimonial Admiralty Condenser Tubes.

But the real test takes place right on the job—where stresses, strains and corrosion are at their very worst. Chase Antimonial Admiralty Condenser Tubes pass *that* rugged trial with flying colors!

It follows that the longer condenser tube life you get from Chase Antimonial Admiralty *also* means lower operating costs, fewer breakdowns and more time between tube replacements!

Get the benefit of extra years of service—insist on Chase Antimonial Admiralty!

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

Prompt Delivery from Cleveland and Waterbury Mills

The Nation's Headquarters for Brass & Copper

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Charlotte	Dallas	Houston	Milwaukee	New York	Rochester
	St. Louis	San Francisco	Seattle	Waterbury	

UP Distribution Regulator Ratings to 167 Kva

DOWN Cost of Regulation

Here's the best regulator news since Allis-Chalmers originated 5/8% step regulation over 22 years ago:

► Now—you can get the same high-quality regulation . . . the same time-proved mechanism you've always had in Allis-Chalmers station-type equipment . . . and . . .

► *At lower cost . . . you can now use single-phase distribution regulators* . . . instead of using station regulators or load tap-changing transformers.

This has been done by taking advantage of over twenty-two years of regulator development. The result — a regulator that combines the advantages of mass production and simplification of parts with the elimination of features that do not directly contribute to regulation.

You get the same 1% control accuracy and 20% range of regulation as in station regulators. Eight years of field operation have proved Allis-Chalmers distribution regulators will stand up under toughest operating conditions.

ALLIS-CHALMERS
Originators of 5/8% Step Voltage Regulation

Ratings Available

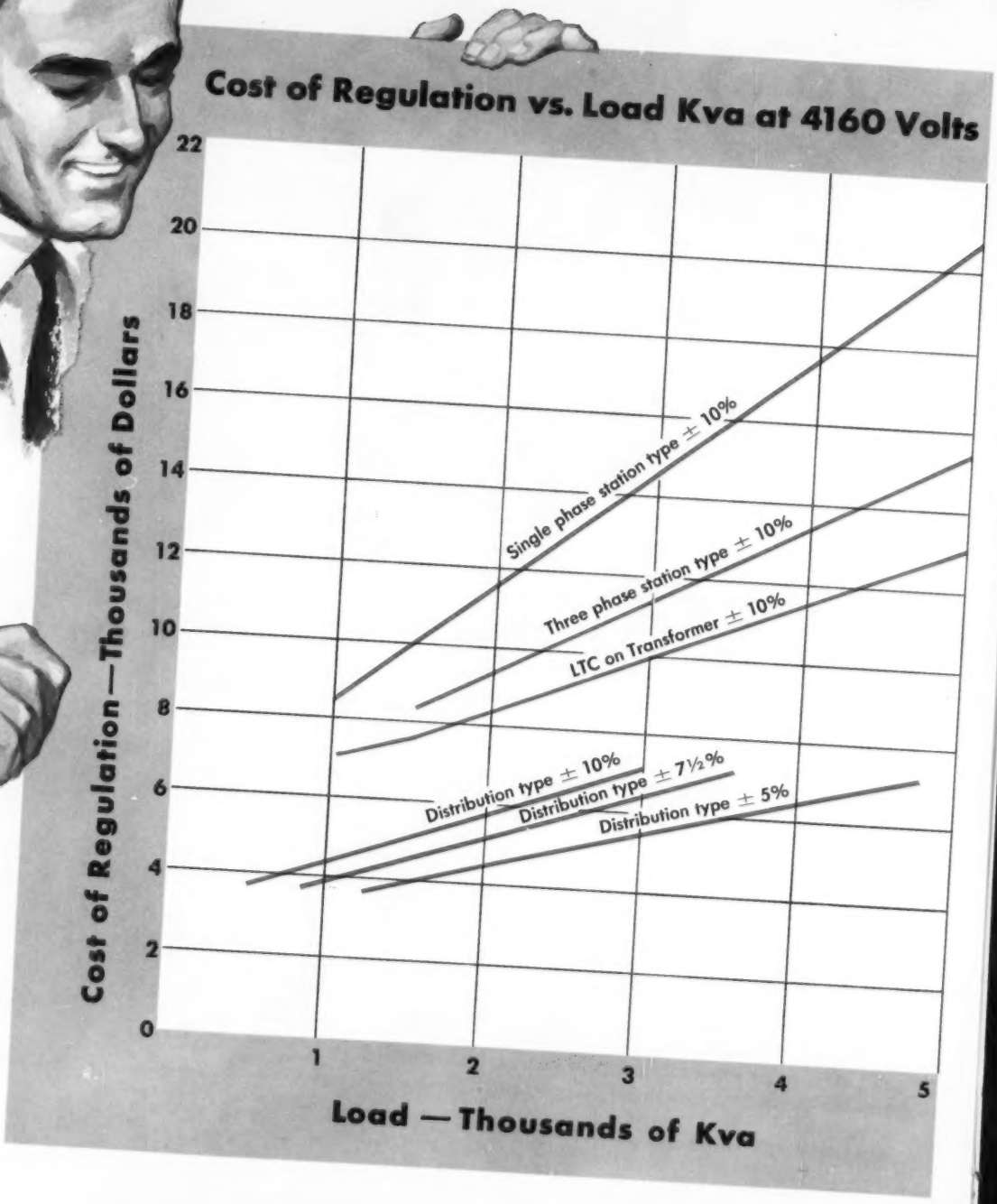
14,400 volts — 50, 100 amp
7,620 volts — 15, 25, 50, 75, 100, 150 and 219 amp
5,000 volts — 50, 100, 150 and 200 amp
2,500 volts — 100, 150, 200, 300 and 400 amp

Chart on Next Page Shows BIG SAVINGS

ALLIS-CHALMERS

A-4946

Save Up



ALLIS-

to 50%

ALLIS-CHALMERS
Originators of
5/8% Step
Voltage Regulation

with

New Single-Phase Distribution Regulators

With the low cost of distribution regulators, it may pay you to re-evaluate the methods of voltage regulation on your system. In many cases you'll find it is now possible to bring the advantages of single-phase distribution regulation to every feeder in the system. Everyone benefits. You'll get 1% control accuracy, 20% range of voltage regulation—increased revenue and profits.

In addition to the savings in first cost, you have greater installation flexibility.

Check the Comparison in the chart below:

Type of regulation	3000-Kva Load 4160 Volts, 400 Amp	5000-Kva Load 13,800 Volts, 219 Amp
Three 1-phase station regulators	**$14,610**	**$21,900**
One 3-phase station regulator	**11,520**	**15,705**
Load tap-changing portion of transformer	**9,916**	**13,206**
Three 1-phase distribution regulators	**7,050**	**10,611**

Why Pay a Premium of 24% to 100%?

CHALMERS

A-C ALLIS-CHALMERS

Vari-Amp Feature

permits tailoring regulator to system needs

One Regulator Provides

5 Current Ratings

25 Regulating Combinations

Here's what this means: There's no need to use ± 10% regulation if your system can operate more profitably at reduced regulation and increased load.

Or, look at it another way; as loads grow, there's no need to change regulators when Allis-Chalmers regulators are on your system. The *Vari-Amp* feature lets you step up ratings as much as 60% by slightly reducing the range of regulation.

Here's how it works: By reducing the range of regulation you can increase the current-carrying capacity. The *Vari-Amp* feature provides stops that limit the range of regulation in 5 current ratings and 25 regulating combinations.

Also Use Unequal Ranges

You can also get considerable flexibility using unequal ranges of regulation. For example, set the *Vari-Amp* feature to provide 6¼% raise at 135% current, 10% lower at 100% current.

No Extra Cost

The *Vari-Amp* feature is available on all Allis-Chalmers regulators.

Get the full story on this and all the other features of Allis-Chalmers regulators. Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Through Mountainous Terrain, Dust Storms and Weather Extremes . . .

From a point on Colorado's Cheyenne Mountain, the microwave beam is relayed over mountains and prairies alike in its 230-mile swing to gas fields in Kansas and Oklahoma.

RCA Microwave's Dependability

has justified Colorado Interstate Gas Co.'s choice for pipeline communications system

When Colorado Interstate engineers studied communication facilities to connect home office with pipeline compressor stations and with gas-producing fields in Kansas and Oklahoma, they considered wire line, common carrier and microwave. They chose RCA Microwave.

According to W. I. Blount, Superintendent of Dispatching and Communications, "RCA Microwave offered many advantages. It provided relatively easy maintenance, static-free operation and was economically equal to wire line or common carrier. And the more numerous the channels, the cheaper by comparison it became.

"In addition, such a microwave system made it possible to integrate into our already established VHF radio system more stations and mobile units and thus increase the efficiency and scope of our radio system. It offered almost unlimited future possibilities, such as telemetering channels, facsimile, teletype, additional voice channels, remote control of unattended stations and a service channel—all at a relatively small cost."

Only RCA MICROWAVE systems provide so many advanced engineering features. For example, single sideband suppressed-carrier frequency-division multiplex is used exclusively to meet high standards of dependability. Frequency is controlled from the terminal through the entire system.

Microwave specialists will be glad to answer any questions and plan your installation. Mail coupon for further particulars on use of Microwave in utilities, pipelines, turnpike and other applications.

RCA MICROWAVE

POINT-TO-POINT COMMUNICATION

RADIO CORPORATION of AMERICA
COMMUNICATIONS EQUIPMENT
CAMDEN, N. J.

Radio Corporation of America
Communications Equipment, Dept. AD-45, Building 15-1, Camden, N. J.

☐ Please send me latest literature on RCA Microwave

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

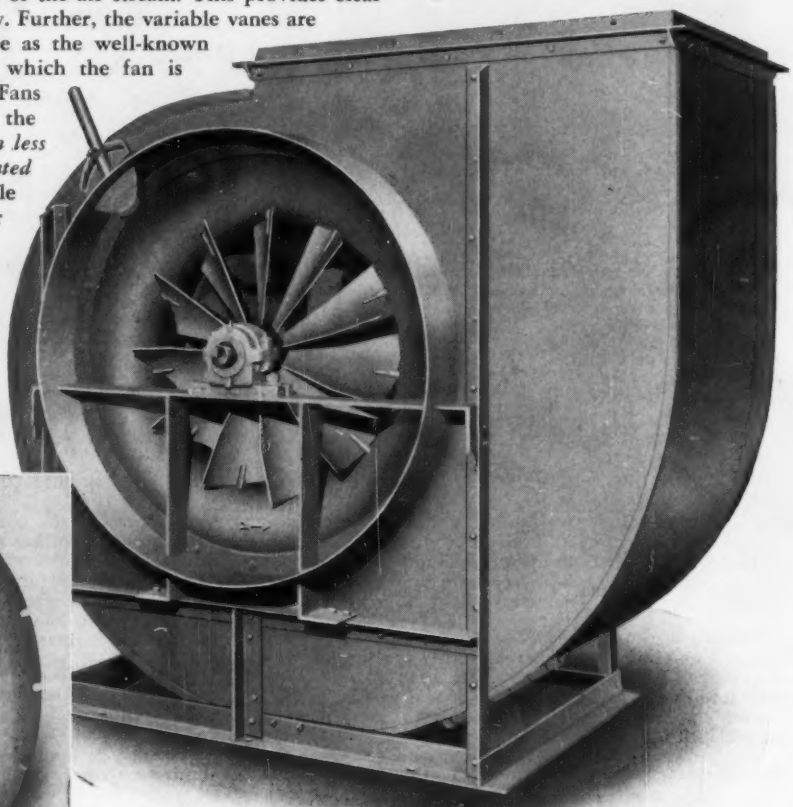
☐ Have an RCA Representative get in touch with me.

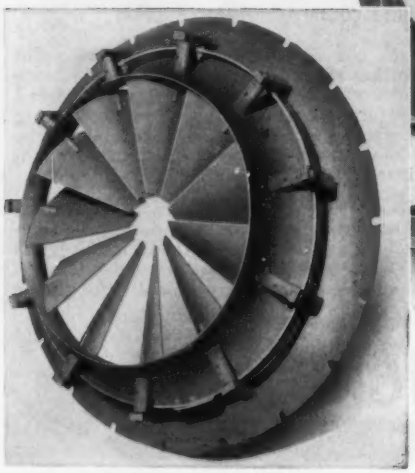
NOW! "BUFFALO" VARIABLE INLET DRAFT CONTROL

— WITH FIXED VANE PERFORMANCE AT WIDE OPEN POSITION

The variable inlet vanes of this "Buffalo" Forced Draft Fan are cantilevered into the fan's inlet shroud, with the operating linkage behind the shroud and entirely out of the air stream. This provides clear and unobstructed air flow. Further, the variable vanes are curved to the same degree as the well-known "Buffalo" fixed vanes, for which the fan is designed. Because "Buffalo" Fans are designed for fixed vanes the use of variable vanes *results in less than one percent reduction in rated capacity.* Construction is accessible and trouble-free. The entire lever and control ring assembly is permanently aligned for smooth operation with no backlash.

Here is one more illustration of the "Q" Factor* of performance and satisfaction that is yours when you specify "Buffalo" for mechanical draft.





Note how cantilevered arrangement of "Buffalo" Variable Inlet Vanes permits unobstructed air flow. Write for Bulletin F-1510 for full details on this smooth draft control with high performance.

The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.

"Buffalo"

BUFFALO FORGE COMPANY

BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING

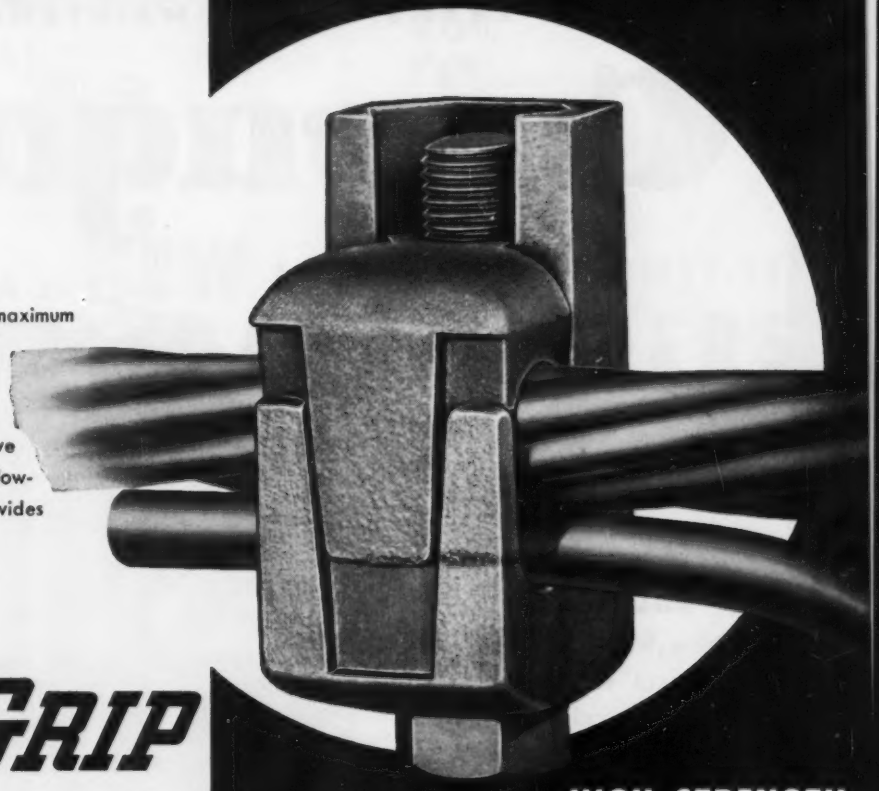
Anderson's SUCCESSOR to the SPLIT BOLT

EXTRA Strength . . .
high strength bronze alloy bodies
and high-tensile silicon bronze bolts.

EXTRA Savings . . .
re-usable, time and time again.

EXTRA Fast . . . simple, one-piece construction allows installation over two maximum size conductors without disassembly. No falling off line during assembly.

EXTRA Dependable . . . positive high-pressure clamping action maintains low-resistance contacts. Design of "jaws" provides complete enclosure of the conductors.



HIGH STRENGTH
BRONZE ALLOY

DuraGRIP "DG" CONNECTORS

The answer to any problem of high-pressure contact in their cable range . . . especially designed to meet today's increasing loads on distribution systems. The extra clamping strength of Anderson's "DG" Connectors assure trouble-free, long-life connections. Long, strong "jaws" plus long silicon bronze bolts combine to provide linemen with a truly "fumbleproof" connector that will save time and eliminate handling difficulties. They will "hang" without turning over . . . no nuts to lose . . . no need *ever* to completely disassemble.

Catalog Number	Cable Range Max. Solid	Cable Range Max. Str.	Max. Nominal Cable Diameter
DG-8	6	8	0.162
*DG-8SH	6	8	0.162
DG-6	4	6	0.210
*DG-6SH	4	6	0.210
DG-4	3	4	0.233
DG-2	2	3	0.258
DG-1	1	2	0.292
DG-1/0	2/0	1/0	0.368
DG-2/0	3/0	2/0	0.414
DG-4/0	4/0	4/0	0.522

*Furnished with slotted head bolts

NOTE: Minimum clamping range is one maximum conductor.

FOR MORE COMPLETE INFORMATION . . . consult your nearest ABW representative or contact our home office.

ABW

Aluminum & Bronze POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES
for SUBSTATION • TRANSMISSION • DISTRIBUTION SYSTEMS *for over a Quarter Century*

ANDERSON BRASS WORKS, INC.

P. O. DRAWER 2151 BIRMINGHAM 1, ALABAMA

HERE'S THE PRACTICAL SOLUTION TO AN IMPORTANT NETWORK TRANSFORMER MAINTENANCE PROBLEM:

Corrugated

500 Kva, 15 Kv

Grounding switch internally mounted

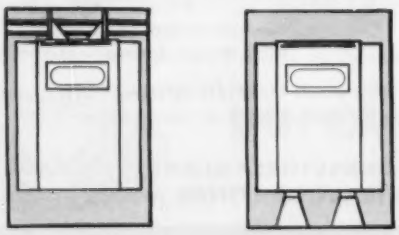
ONLY 50″ HIGH

Pennsylvania Network Transformers with Corrugated Cooling available in sizes 500-750-1000 kva. 5-15 kv.

Disconnect and grounding switch can be externally mounted.

CORRUGATED COOLED NETWORK TANK FEATURES

SUSPENSION MOUNTING OR PEDESTAL MOUNTING



CORRUGATED COOLING

for genuine ease of

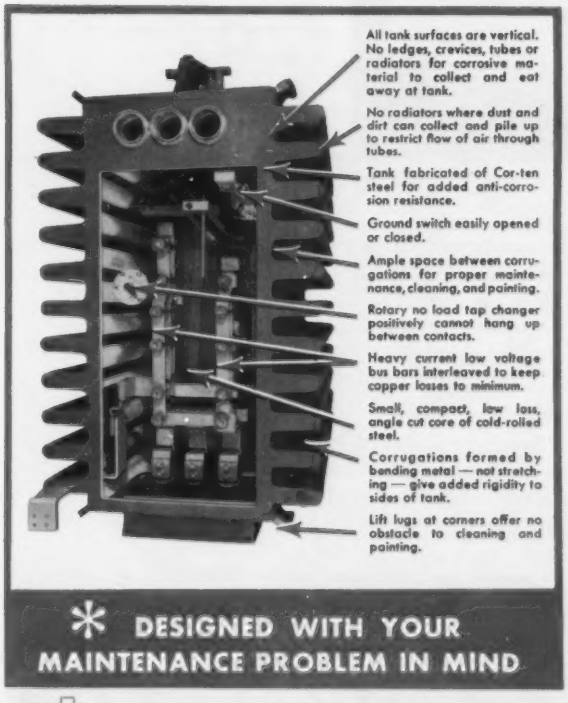
INSPECTION
CLEANING
PAINTING

Cooling*

IN PENNSYLVANIA'S NEW LOW-HEIGHT, SUBWAY-TYPE NETWORK TRANSFORMERS

In Pennsylvania's new subway-type network transformers, tank corrugations instead of conventional tubes and radiators provide the necessary radiating surfaces for proper cooling of the insulating liquid.

Tanks with smooth, vertical, corrugated surfaces have certain fundamental advantages for network transformers that are installed underground. They are easy to maintain properly in subway vaults where water, sludge, salt, and sewage are constantly eating and corroding away transformer cases and particularly transformer cooling tubes.


All tank surfaces are vertical. No ledges, crevices, tubes or radiators for corrosive material to collect and eat away at tank.
No radiators where dust and dirt can collect and pile up to restrict flow of air through tubes.
Tank fabricated of Cor-ten steel for added anti-corrosion resistance.
Ground switch easily opened or closed.
Ample space between corrugations for proper maintenance, cleaning, and painting.
Rotary no load tap changer positively cannot hang up between contacts.
Heavy current low voltage bus bars interleaved to keep copper losses to minimum.
Small, compact, low loss, angle cut core of cold-rolled steel.
Corrugations formed by bending metal — not stretching — give added rigidity to sides of tank.
Lift lugs at corners offer no obstacle to cleaning and painting.

* DESIGNED WITH YOUR MAINTENANCE PROBLEM IN MIND

The entire tank can be cleaned and even painted from a position above the transformer with complete assurance that the workman will be able to see and reach every bit of surface on the tank.

As a further measure of safety against corrosion, tanks, covers and bottoms are fabricated of Cor-Ten steel which has an inherent resistance to corrosion that is two to three times better than copper-bearing steel.

And there is more to this new transformer than Cor-Ten Corrugated Cooling. In the network transformer pictured here, where the grounding switch is mounted internally, the entire transformer, including the core and coils, was redesigned. It was reduced to two-thirds the size of the preceding model, which means it will fit into a small vault, or even replace a *smaller* Kva transformer in an existing vault. This particular model is only 50 inches high, and can be provided with brackets for suspension mounting, or pedestals for installation high above the floor of the vault.

If you are interested in learning more about these *really new* corrugated-cooled, subway-type network transformers, please contact Pennsylvania Transformer Company's Power Sales Department. Competent engineers will be happy to come to your office to discuss these transformers in complete detail.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • **CANONSBURG, PA.** • *Greater Pittsburgh District*

Widespread Acceptance of Hotpoint Automatic Clothes Dryers

Increases Utility Revenue!

Hotpoint

SUPER DE LUXE SEALED-CHAMBER DRYER

No venting required! (1) Purified, heated dry air (2) takes moisture and lint from clothes (3) cold water spray condenses moisture (4) lint and water are pumped down into the drain.

Hotpoint

AIR-BLOWER DRYER

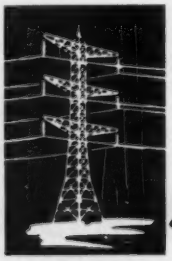
One connection for either 115 or 230-volt operation! Hotpoint quality, features and construction, in a low price automatic featuring Air-Blower drying. New Wide-Screen Lint Filter is convenient, efficient.

Promote the load that promotes profits! More Dryers on your lines mean greater revenue for you. Automatic Clothes Dryers use an average of over 750 Kilowatt hours annually—***and that usage is almost entirely concentrated in off-peak hours!*** With the demand for Dryers more than tripled in just five years, opportunities for increased utility revenue are better than ever.

Promote the dryers that promote acceptance! Hotpoint's leadership in engineering has accelerated consumer acceptance through ***exclusive*** automatic features and dependability of operation. The amazing Hotpoint Sealed Chamber Dryer requires ***no venting*** yet moisture, heat and lint cannot escape into the room. And famous Hotpoint quality and performance are also available in the low-cost Hotpoint Air-Blower Dryer that can be used on either 115 or 230-volt circuit!

Promote the line that helps you promote! Hotpoint provides you with established acceptance in a wide-open market—and backs you up with an aggressive, hard-hitting merchandising program designed specifically for utility use. Get the complete story on how Hotpoint can help ***you*** increase ***your*** revenue. See your Hotpoint Distributor—***soon!***

Again, Hotpoint



looks at Tomorrow, Today!

HOTPOINT CO. *(A Division of General Electric Company)* **5600 West Taylor Street, Chicago 44, Illinois**

Ljungstrom® field engineers assure you of maximum return on your preheater investment

Your Air Preheater Corporation field engineer aims to visit your installation at least once a year. It's his job to give you the help and advice you need to assure you of maximum return on your Ljungstrom Air Preheater investment.

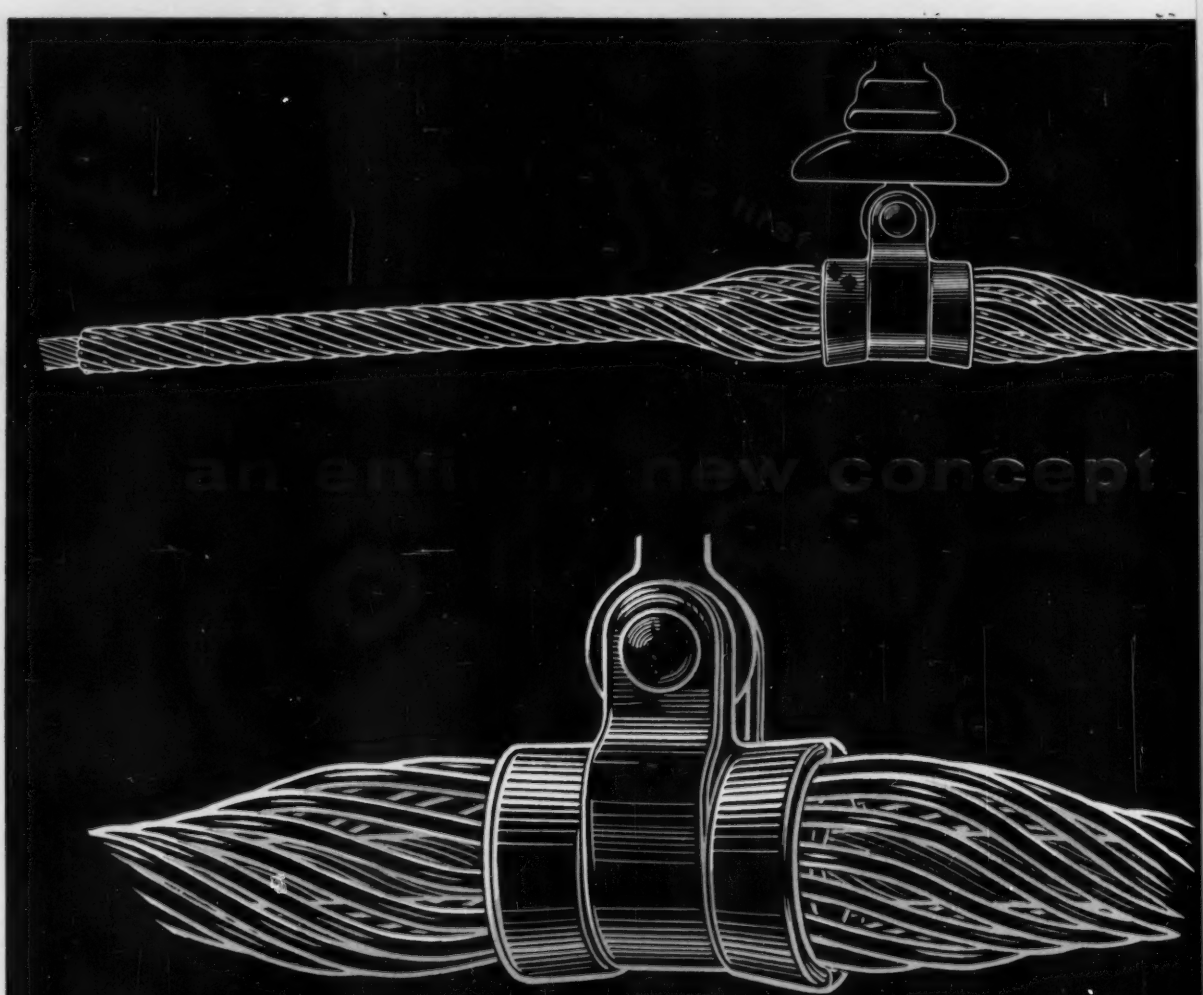
This field service is another factor in making the Ljungstrom the most economical heating surface on the modern boiler. And it helps explain why 7 out of 10 modern preheater installations are Ljungstroms.

Get all the details on the Ljungstrom Air Preheater. Why it cuts fuel costs . . . helps maintain higher boiler efficiencies . . . why it speeds cleaning and maintenance. You'll find all the details in the new, 38-page reference manual, "Ljungstrom Air Preheaters." Write for your free copy, today!

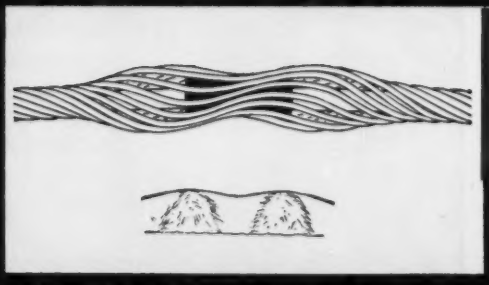
Advantages of the Ljungstrom Air Preheater

- Size for size, recovers more heat than any other type.
- Reduces fuel consumption. Permits use of lower-grade fuels. Increases boiler output and reliability.
- Eliminates cold spots . . . keeps corrosion to a minimum.
- Easier, faster to clean and maintain.
- Requires far less supporting steel and is quickly erected.

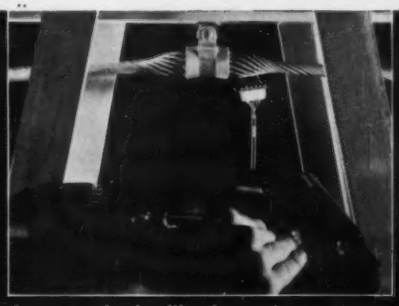
The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.



SALES REPRESENTATIVES—**C. B. Anderson Co.,** *Tulsa, Oklahoma City, Amarillo, Lawton* • **Belcher and Associates, Inc.,** *Jacksonville, Miami* • **Bergstrom-Verburg Co.,** *Minneapolis* • **Vincent J. Brown Co.,** *Buffalo, Syracuse* • **Burns Electric Co.,** *Pittsburgh* • **Carlton Cooley,** *St. Louis* • **F. C. Clatterbaugh,** *Omaha* • **Earl S. Condon Co.,** *Los Angeles* • **Cory and Crum,** *Indianapolis* • **The Electrical Distributors Co.,** *Philadelphia* • **Engineer Sales Co. of Carolina,** *Columbia* • **J. S. G. Electric Co.,** *Chicago* • **E. L. Flowers,** *Westwood* • **George R. Horne and Co.,** *Dearborn, Toledo* • **Johnson Sales Co.,** *Bay City* • **H. L. Macon and Co.,** *Atlanta* • **Peterson Co.,** *Denver* • **Elgin B. Robertsen, Inc.,** *Dallas, Houston* • **K. M. Ryals Co.,** *San Francisco* • **Shaffer and Nelson,** *Portland, Seattle, Spokane* • **M. H. Snyder & Sons,** *New York* • **Curtis H. Stout & Co.,** *Little Rock, Memphis, New Orleans, Jackson* • **L. G. Wendegatz,** *Kansas City*



CONDUCTOR FLOATS freely through "clamping" region. A protective "cage" of Armor Rods applied over a cushioning neoprene sleeve eliminates clamping stress.



Accurate checks, like the strain gauge test shown here, record the performance of the ARMOR-GRIP SUSPENSION under vibration. Results prove that vibration stress in all conductor elements is reduced up to 50%.

In the PLP Laboratory, the ARMOR-GRIP SUSPENSION is proven under severe vibration conditions.

in suspension design

After five years of intensive laboratory research and field experience, Preformed Line Products Company announces the ARMOR-GRIP SUSPENSION. This is not just a modification of the conventional clamp—in fact, in a sense it is not a "clamp" at all. The ARMOR-GRIP SUSPENSION is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Armor Rods which distribute their pressure over a relatively large area. An ingenious relation between rods and housing prevents the suspension assembly from slipping longitudinally. The expanded configuration of the PLP rods also adds rigidity to the conductor while slight vertical resilience of the conductor mounting eliminates a steep stress gradient.

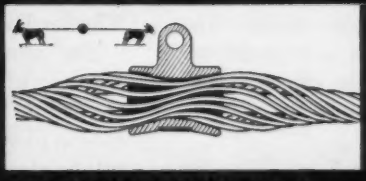
THE ARMOR-GRIP SUSPENSION ELIMINATES CONCENTRATED CLAMPING STRESSES.

In severe accelerated vibration tests, conductor mounted in the PLP ARMOR-GRIP SUSPENSION outlasts conventional clamp assemblies many times—in fact, no conductor failures have ever occurred under the ARMOR-GRIP SUSPENSIONS in these tests. Thousands of ARMOR-GRIP SUSPENSIONS have been installed during the past four years—with NO reported case of unsatisfactory performance.

Yet with all these functional advantages, the ARMOR-GRIP SUSPENSION is very easy to install. Simplicity of design has eliminated many parts—there are less than one-half the number contained in a conventional clamp assembly. Only one nut to tighten.

The ARMOR-GRIP is immediately available in conductor sizes in the ranges of 336,400 cm, 477,000 cm, 795,000 cm, 954,000 cm ACSR and All-Aluminum. Other sizes will soon be available and can be produced on request.

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.



EXPANDING THE PREFORMED ARMOR RODS in the support region greatly increases the rigidity of the conductor just as struts in a frame increase rigidity.

WITHSTANDS SLIPPING UNDER UNBALANCED SPAN LOADS. Conical shaped armor rod "saddle" seated in contoured casting prevents conductor shifting in assembly. Only cushioning neoprene contacts conductor at support center. Conductor is gripped only by PLP Preformed Rods which distribute pressures over large conductor areas.

CORONA AND HEAT LOSSES. The ARMOR-GRIP is symmetrically designed and radiused—with no protuberances —thus eliminating a source of corona emission and radio influence. The metal componenrs are all-aluminum alloy—there are no magnetic heat losses.

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

TELEPHONE: CLEVELAND EXPRESS 1-3571

UNION ELECTRIC adds

Unit No. 3 at MERAMEC STATION will be served by a Foster Wheeler twin furnace, dual circulation, differentially fired, reheat steam generator of 1,850,000 lb/hr capacity

With the addition of this 275,000-kw Unit No. 3 at Meramec Station, Union Electric Company of Missouri will boost total station capacity to 560,000 kw, keeping well ahead of anticipated load growth.

The new turbine will be served by an FW steam generator with a maximum continuous capacity of 1,850,000 pounds steam per hour, 2150 psig at the superheater outlet, 1010F/1010F. This unit is unique in that it combines twin furnace arrangement, dual circulation and reheat—three major advances in modern, large capacity steam generator design. The selection of this combination is a gratifying expression of confidence in the efficiency and dependability of Foster Wheeler steam generating equipment.

The twin furnace design, a Foster Wheeler development, provides sufficient water-cooled and steam-cooled areas to prevent slagging of boiler and superheater surfaces. The use of combination radiant and convection surfaces for superheating, plus differential firing, permits constant final and reheat steam temperatures over a wide operating range, stabilizing steam conditions for maximum turbine efficiency.

Dual circulation, another Foster Wheeler development, has been incorporated as insurance against potentially troublesome silica deposition in the turbine.

Coal for the differential-fire-controlled furnaces will be pulverized in three Foster Wheeler Ball Mills.

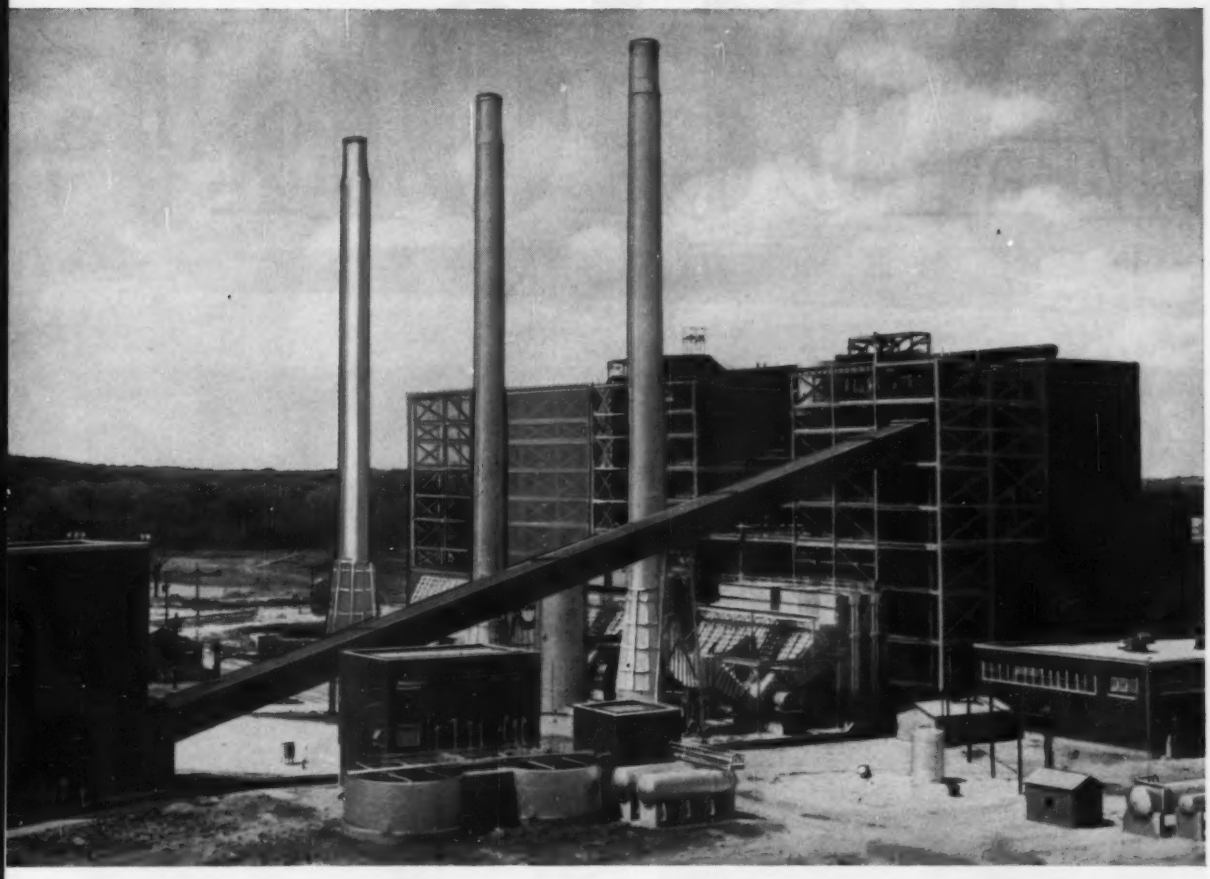
The proved dependability and long-range economy of Foster Wheeler steam generators are backed by more than 50 years of experience in pioneering power plant equipment. We will be pleased to quote on your requirements. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

STEAM GENERATORS
SURFACE CONDENSERS
FEEDWATER HEATERS
HEAT EXCHANGERS

FOSTER

NEW YORK • LONDON

1,850,000 lb steam per hr!



The above photograph of Union Electric's Meramec Station shows, in color, the new Unit No. 3 as it will appear when the addition is completed in 1958. With a capacity of 275,000 kw, Unit No. 3 will increase the total output of Meramec Station to 560,000 kw. keeping system capability well ahead of maximum anticipated load growth.

Reddy Kilowatt

• Trade mark character used by permission of Reddy Kilowatt, Inc.

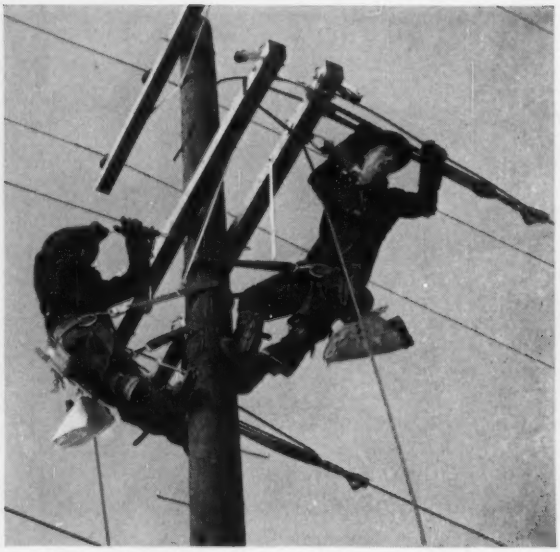
WHEELER

• PARIS • ST. CATHARINES, ONT.

ECONOMIZERS
BALL MILL PULVERIZERS
COOLING TOWERS

Action!

Action! on sales service for an Illinois utility by a Kaiser Aluminum sales engineer who delivered vitally-needed accessories in less than 24 hours!



Action! for an Arizona utility when Kaiser Aluminum engineers provided "invaluable" field assistance on an installation of weatherproof!

Kaiser Aluminum services available to you:

Field Service—Experienced Kaiser Aluminum field engineers are available to work with your crews on stringing jobs; demonstrate ways to speed installations and cut costs.

Engineering Service—Kaiser Aluminum engineers and specialists work with you in power system planning and design; furnish technical information such as stringing sag tables and sag-and-tension charts on request; help keep you up to date on latest construction techniques; help solve specific installation problems.

Laboratory Service—Kaiser Aluminum laboratories continually evaluate accessories, enabling us to suggest accessories and installation procedures designed to give you maximum service and economy. They offer assistance on phases of your operations involving fundamental research. They also continually check Kaiser Aluminum conductor to insure consistent high quality.

Delivery Service—Kaiser Aluminum's reputation for on-time delivery is unsurpassed in the industry.

Kaiser Aluminum distributor coverage is the best in the country. There's a distributor conveniently located to serve you, wherever you are. His many services include: large stocks of Kaiser Aluminum conductor, fast delivery to help reduce your inventory, up-to-the-minute information to help keep you abreast of latest developments, friendly, personal attention to any size order.

You get these complete services at no extra cost when you specify Kaiser Aluminum conductor.

...that's what electric utilities get from Kaiser Aluminum

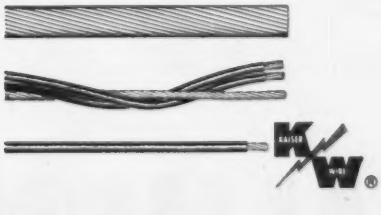
Action! from the mill that put 40,000 pounds of conductor in an Oklahoma utility's hands in less than 24 hours—preventing a costly work stoppage!

Action! on engineering service for a large eastern utility that helped them solve a tough river crossing by developing new methods and techniques!

THOUSANDS of our customers will tell you that Kaiser Aluminum's kind of service gives them *faster action, more effective action* than they've ever had before!

If it's action *you* are looking for, day after day, we invite you to prove to yourself—with your next order—that Kaiser Aluminum is the one best place to get it!

For immediate attention, contact the Kaiser Aluminum sales office listed in your telephone directory or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Bldg., Oakland 12, California.



Kaiser Aluminum

setting the pace—in growth, quality and service

Polyethylene & Neoprene Weatherproof and Triplex • Quadruplex • ACSR
All Aluminum Conductor • Rectangular, Solid Round and Tubular Bus

COMPACT NETWORK
Save Cost of Vault

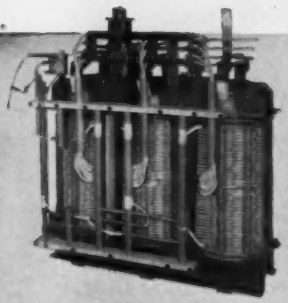
NIAGARA MOHAWK POWER COMPANY solved a space problem with these Allis-Chalmers network transformers. Increasing loads in concentrated areas in Buffalo, N. Y., called for transformers rated higher than those for which the vaults had originally been built. Considerable changes in the vault sizes might have been required. But the compact design of these Allis-Chalmers network units made it possible to fit 750-kva network transformers in vaults that were originally designed for 500-kva transformers.

Fast Delivery

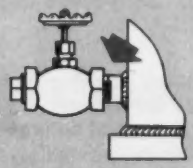
In addition to saving vault reconstruction costs, Allis-Chalmers methods helped handle an unexpected load growth emergency. These units were originally scheduled for delivery in April, 1954. They were actually shipped five months ahead of schedule, thus facilitating system improvements.

1½ Million KVA in Operation

Excellent design, compactness, and good service explain why over 1½ million kva of Allis-Chalmers network transformers are on the job in utilities throughout the country. Utility experience with these units has proved their economy for installation and operation. Before you consider your next network installation, it will pay to get complete facts about Allis-Chalmers network transformers. Call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4495



DESIGN AND CONSTRUCTION FEATURES



Compact, low-loss design. Thermal capacities are high for contingency load conditions. Sturdy, time-proven core and coil construction meets repeated short-circuit stresses of network operation.

Safe, dependable no-load tap-changing mechanism. Handle inserted through two-inch opening on cover operates the tap-changing mechanism. Handle cannot be removed unless it is in positive tap position. Cover location of handle entrance eliminates packing gland maintenance.

Threaded valve connections to tank are solder-wiped for extra protection. Valves are located for easy access. Globe-type valves with non-rotating seats close tight, avoid wear on valve seats.

Spiral-wound gaskets. Over 6 years' continual use has proved their superiority over other types of gasketing material for sealing bushings in the tank wall. Alternate plies of preformed spring-like metal and non-metallic fillers provide unusual resilience and actually adjust themselves to changes in operating conditions. Gaskets can be installed without cements or grease. They can be quickly removed if required and may be re-used if necessary.

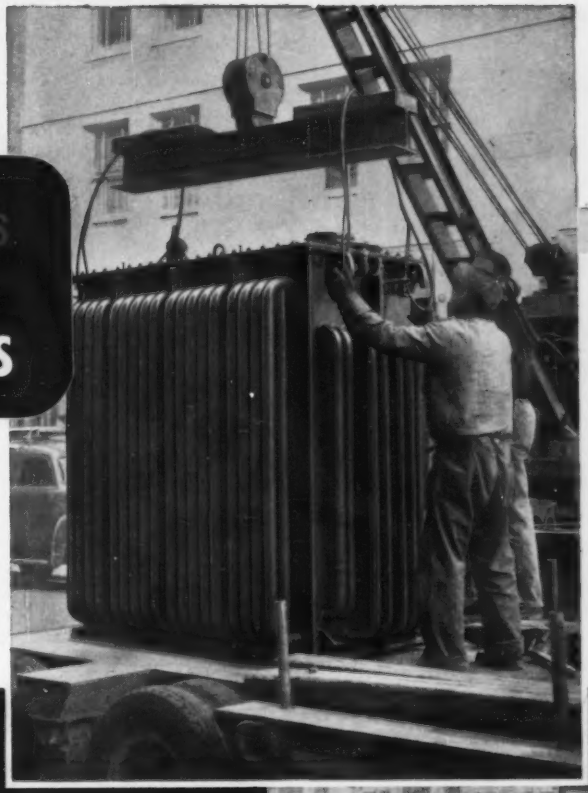
A-C ALLIS-CHALMERS

ALLIS-CHALMERS

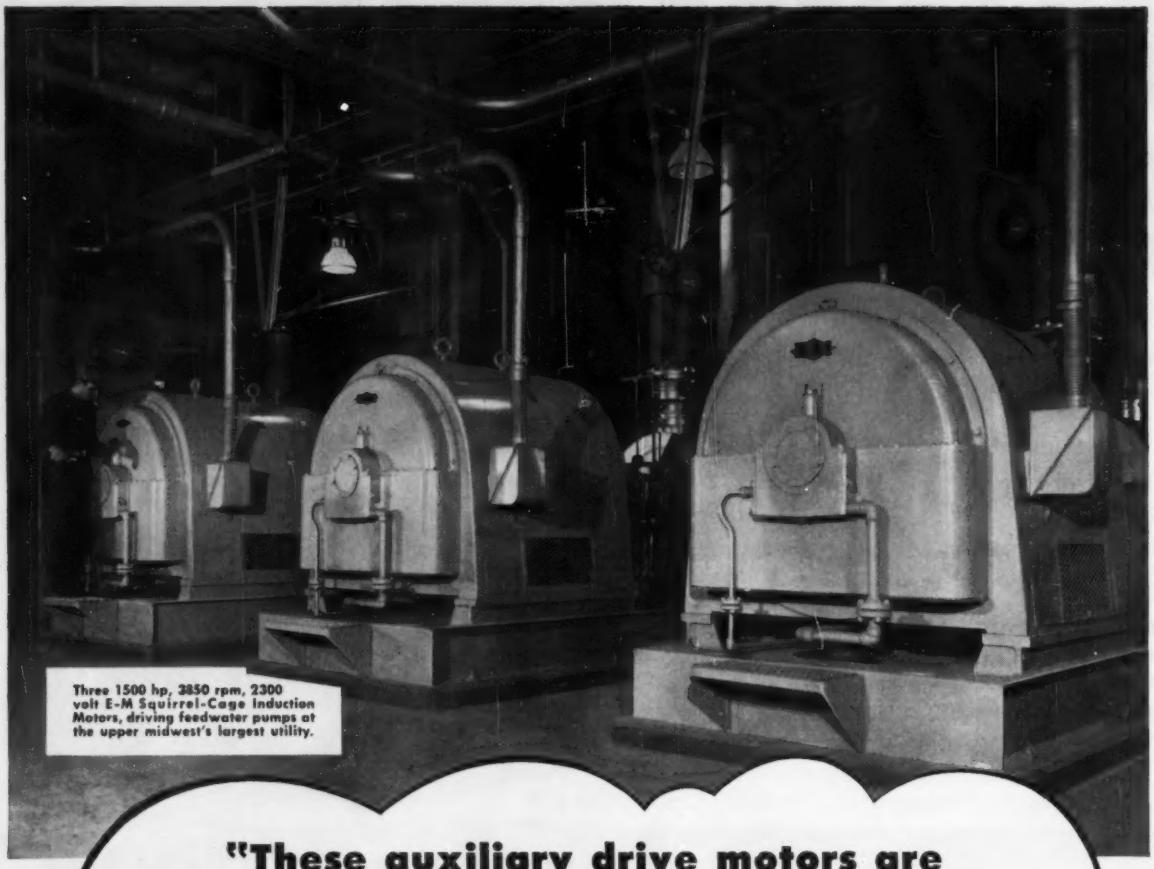
TRANSFORMERS
Expansion

ALLIS-CHALMERS

NETWORK TRANSFORMERS



MOVING NETWORK TRANSFORMERS TO VAULT in downtown Buffalo (right). Photo below shows how 750-kva network transformer fits into 500-kva vault, saving utility cost of reconstruction to meet increased downtown power needs.



Three 1500 hp, 3850 rpm, 2300 volt E-M Squirrel-Cage Induction Motors, driving feedwater pumps at the upper midwest's largest utility.

"These auxiliary drive motors are protected against moisture and vibration!..

"Large auxiliary drive motors need a lot of extras," says Pete Powerhouse, E-M engineer and specialist in their application.

"We protect stator coils with the best step-by-step 'Power House' insulation process involving vacuum-pressure impregnation and multiple varnishing and baking of the entire winding. Coil ends are ruggedly lashed to one another and to heavy bracing rings to guard against distortion.

"You'll find our motors run smooth and quiet . . . aerodynamic blower design and rotor streamlining keep noise level to a minimum. Speaking of the rotor, we make sure it's stiff, strong and precision balanced. And bearings are *Kolene* processed and centrifugally cast to really last.

"So, if you want to forget about factors such as high humidity, fumes, moisture, vibration, noise, etc., ask your nearest E-M sales engineer to show you why E-M *Customized* Motors are so well suited to exacting power station demands. And be sure to check the publications listed below."

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

Pete Powerhouse says...

"Write the E-M factory for Publications No. 189 and 214, which describe in detail the E-M *customized* design and construction that produces these dependable auxiliary drive motors. They will help you select the motor best suited for your application."

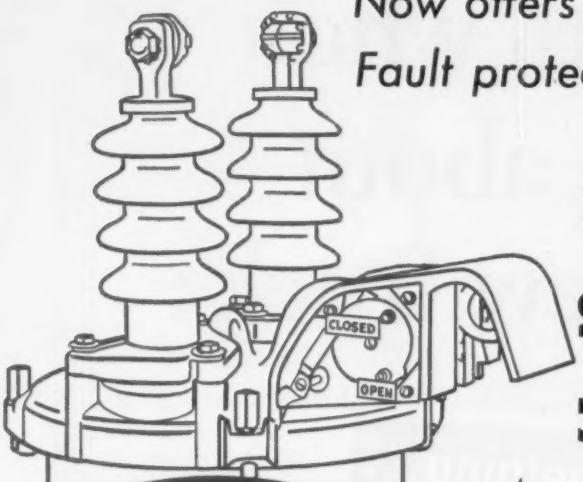
E-M

Specialists in making motors do **EXACTLY WHAT YOU WANT THEM TO**

1300-TPA-2157

R&IE Type MB-2 .. the All New AUTOMATIC CIRCUIT RECLOSER

Now offers much greater Temporary Fault protection - 3 exclusive ways —



1 **FASTEST INTERRUPTION** of any Recloser—1 cycle

2 **FASTEST RESTORATION** of any Recloser—20 cycles

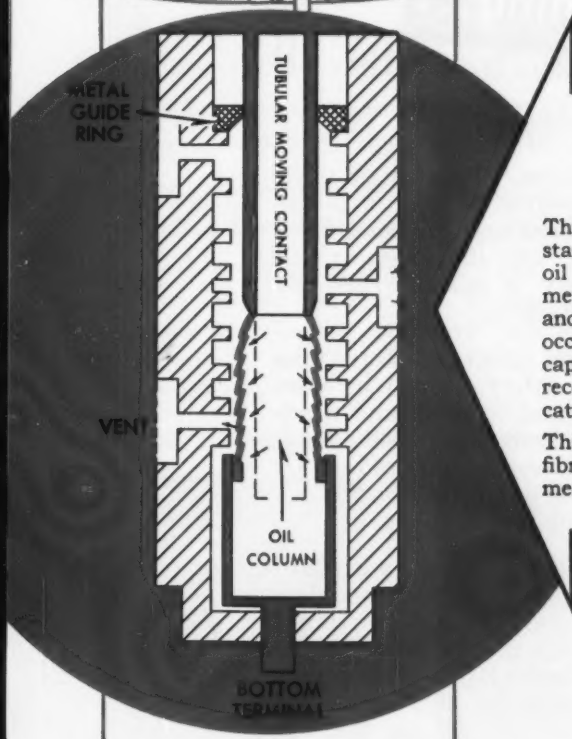
3 **NEW INTERRUPTION PRINCIPLE**—the

SC-OC

SINGLE CONTACT—OIL COLUMN

The Single, Tubular Contact, during operation, moves off the stationary Column of Oil, progressively exposing cool, clean oil to the area where arcing occurs. This arc-quenching method, in conjunction with the interrupting pressure chamber and the radial vents, is so highly effective that interruption occurs in the first half-cycle. Tests prove that it is more than capable of handling both high and low fault currents, and the recovery voltages encountered in any of its intended applications.

This new interrupting principle requires no fibre-to-metal or fibre-to-fibre assemblies—thus eliminating any possibility of mechanical interference resulting from moisture-swollen fibre.



INTERRUPTER CHAMBER SECTIONAL VIEW

Showing tubular moving contact at half way point in operating travel—arc is at highest intensity, about to separate.

Interrupting Capacities

Continuous Current Rating—Amperes	Amperes, RMS Symmetrical at System Voltages of— 4.8 Kv.	7.2 & 14.4 Kv.
100	6000	4000
140	6000	4000
200	6000	4000
280	6000	4000

Write for Bulletin No. 1550B

●

R&IE EQUIPMENT DIVISION

I-T-E Circuit Breaker Co.

GREENSBURG, PENNA.

STRUCTURES—Steel or Aluminum ● TESTING DEVICES ● KIRK KEY INTERLOCK SYSTEMS ● ISOLATED PHASE BUS STRUCTURES ● INTERRUPTER SWITCHES

INDOOR BUS SUPPORTS and BUS FABRICATION ● OUTDOOR BUS SUPPORTS and AIR SWITCHES ● SUBSTATION

To the man who's thinking about buying a new truck:

maybe you're missing something...

And what you're missing is more than "maybe," it's for *sure*—if you haven't yet visited your Dodge truck dealer.

Do you want to miss a *rock-bottom price?* Perhaps you haven't realized that Dodge trucks actually cost *less* than you'd pay for corresponding models of most other makes.

Do you want to miss *power* so high it leads the field? Consider this: with engines of 169 to 175 horsepower, Dodge overpowers *every other leading make of truck* in the low- and medium-tonnage fields.

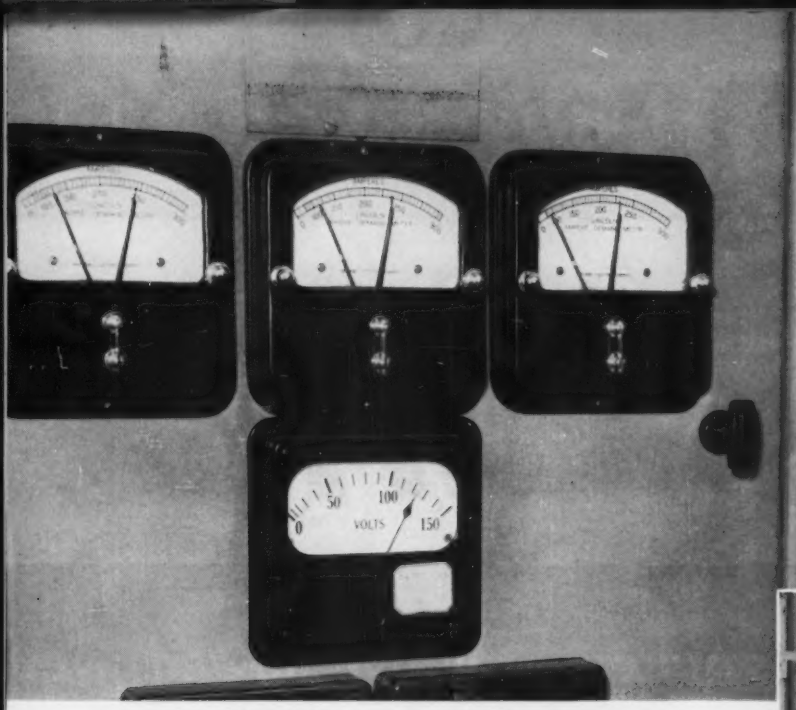
Surely you don't want to miss the many advantages of *"Job-Rated."* Because all units from engine to rear axle are engineered and matched for a specific job, the Dodge truck you buy is exactly *right* for your business.

You don't want to miss Dodge safety—which includes the biggest wrap-around windshield of any truck on the road, the shortest turning radius. Or Dodge superior cab comfort . . . Forward Look Styling.

In short, you get a whale of a lot more truck for a good deal less money than you think! Stop in and see your Dodge truck dealer right away—don't miss *anything!*

DODGE Job-Rated **TRUCKS**

WITH THE *FORWARD* LOOK



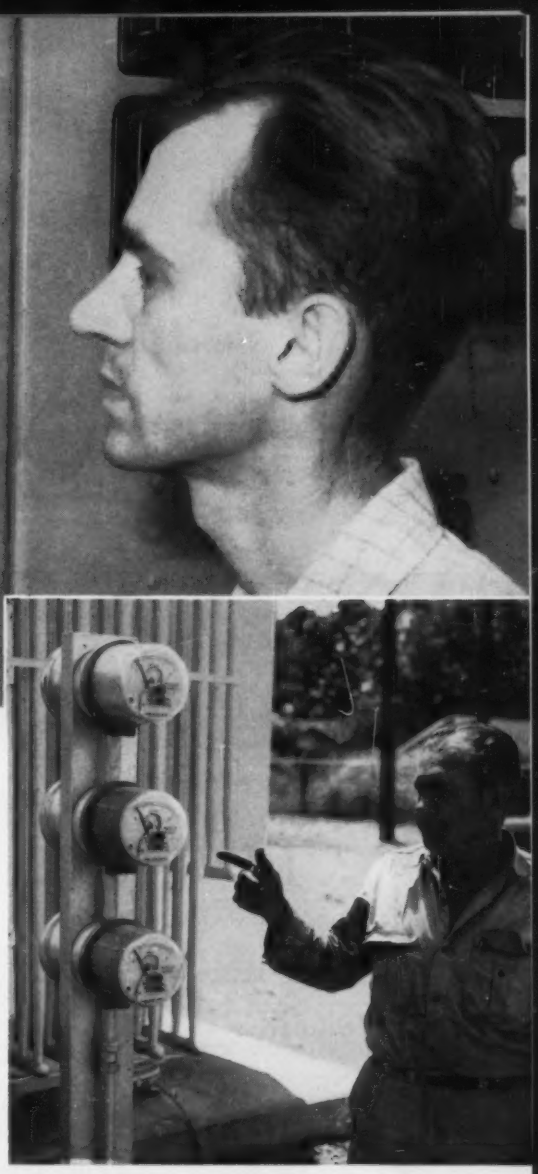
THESE LINCOLN TYPE AD-2 Semi-Flush Switchboard Meters provide continuous information on feeder load and balance in an attended substation.

USE AD* MEASUREMENT FOR SYSTEM BETTERMENT

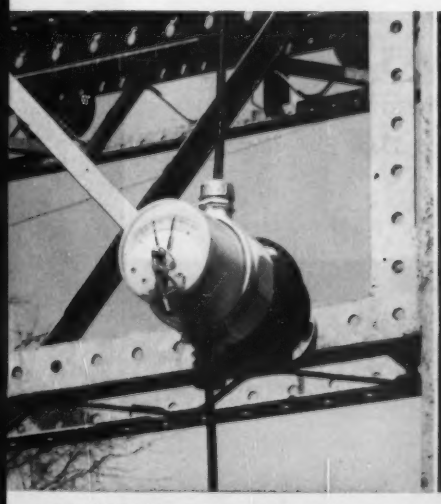
Helps you keep loads balanced to get the most out of system and distribution capacity

Lincoln Ampere Demand (AD*) Meters of the indicating type give you—at very low cost—the continuous information you need to load your distribution system to the ultimate safe limit. For the full story, just write Sangamo for information on "AD Measurement for System Betterment."

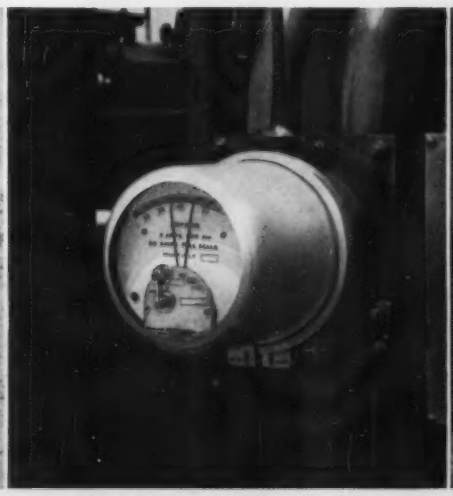
SANGAMO ELECTRIC COMPANY • Springfield, Illinois



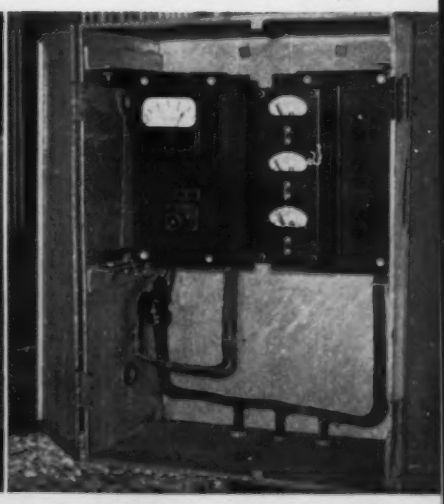
LINCOLN ADS SOCKET TYPE Meters show loading and balance on phases in an outdoor substation.



THIS "HOT" TYPE AD-5 Lincoln Meter indicates amperes and balance on primary feeder circuits. Meter is insulated from ground with a post-type insulator and is arranged for hot stick reset.



THIS LINCOLN ADN METER gives continuous facts on the load magnitude and load balance of "Y" connected transformers. No instrument transformers are necessary.



A TRIPLEX AD-2 INSTALLATION that shows load balance and current values on 4800 volt feeders in an outdoor substation.

SM56-1

For Greatest Reliability over

it's PHILCO POWER

10 times more microwave power gives

EXCLUSIVE WITH PHILCO! Ten times more transmitter power in Philco CLR-7 Microwave systems . . . with a degree of performance and reliability never before attained in microwave equipments.

Heart of the Philco system, the "Power House" Klystron, generates a full watt of power (10,000 watts ERP) in the preferred 6000-7500 mc band.

This Philco CLR-7 Microwave power results in a received signal 10 times stronger—a higher safety margin to overcome adverse propagation conditions.

Philco CLR-7 Microwave equipment can be installed in minimum space... employs reliable, long-life tubes, a positive frequency control system and is completely compatible with existing wire line and two-way radio facilities *and with any type multiplex equipment.*

Get complete data on CLR-7 Microwave equipment. Let Philco help in the planning of your system. Philco maintains a staff of microwave specialists who are experienced system and field engineers. Call a Philco field representative or write Philco, Dept. EW, today.

PHILCO REGIONAL SALES OFFICES

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DALLAS 1, TEXAS
201 Southland Life Bldg.

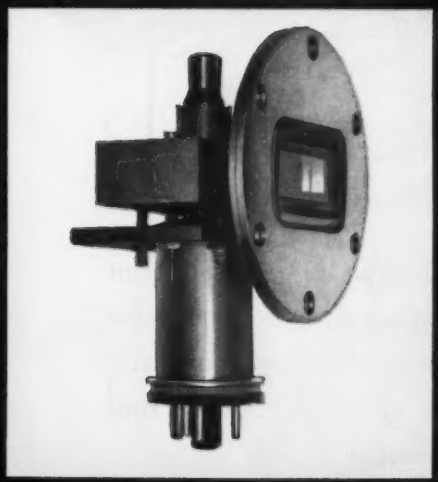
the "Long Haul"

THAT COUNTS!

you advantages like these:

- 160% greater maximum hop distance
- Fewer microwave relay stations
- 10,000 watts effective radiated power—
  50% smaller antennas
- Reduced tower installation costs
- 10 db additional signal safety margin

Philco CLR-7 Microwave repeater . . . rugged! compact! reliable! Built to provide continuous, trouble free service over short or long hauls.



Philco "Power House" Klystron provides the highest equipment power output available in the preferred 6000-7500 megacycle band.

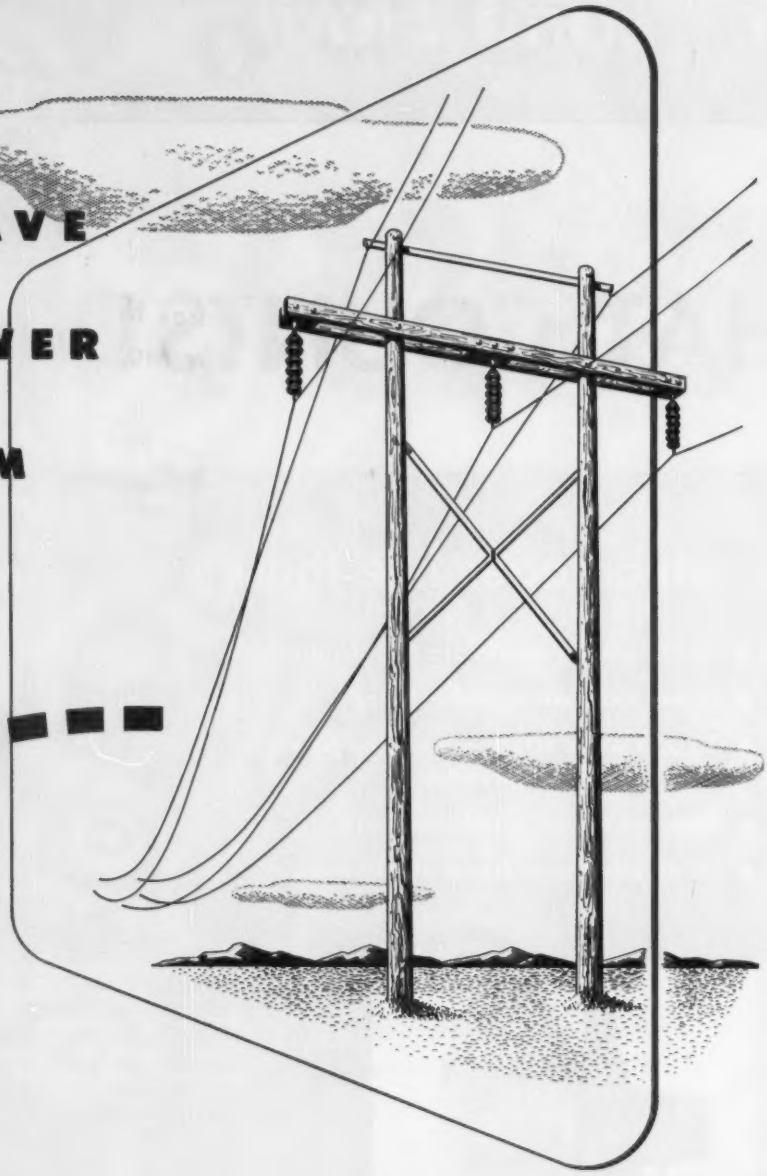
PHILCO CORPORATION

Government and Industrial Division

Philadelphia 44, Pennsylvania

In Canada: Philco Corporation of Canada Ltd., Don Mills, Ontario • In Europe: Philco Corporation, Paris, France.

IF YOU HAVE A MANPOWER PROBLEM



. . . let us help you. Our trained men and special equipment combine to help you meet today's increased demand for power. Whether yours is a problem of erection or maintenance . . . regardless of distance or terrain . . . you'll find Hoosier service efficient and economical.

HOOSIER ENGINEERING CO.

ERECTION and MAINTENANCE of ELECTRICAL TRANSMISSION and DISTRIBUTION LINES

1384 HOLLY AVENUE COLUMBUS 16, OHIO

Magnetic? OR Electronic? WELDER CONTROL — WHICH WILL DO YOUR JOB BEST?

Square D makes them all... for simplest or most exacting applications!

Magnetic

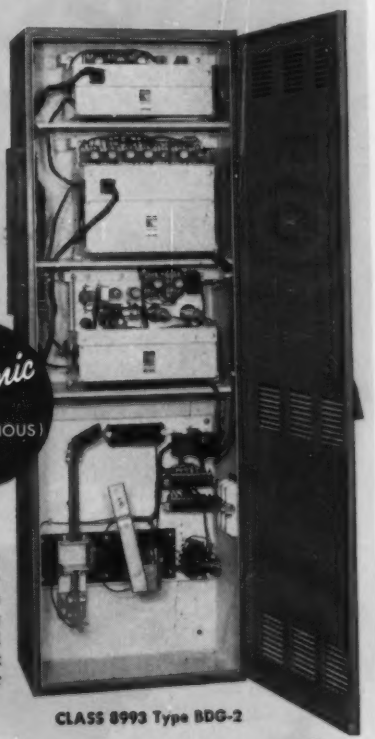
for General Purpose Machines
For applications requiring widely varying welding conditions, normal welding speeds and maximum simplicity.

CLASS 8992 Type BBG-1

Electronic

for High Speed Welding
For production line (gun or stationary) welders and other applications where high speed, high currents or dual gun control are factors.

CLASS 8992 Type BCG-1



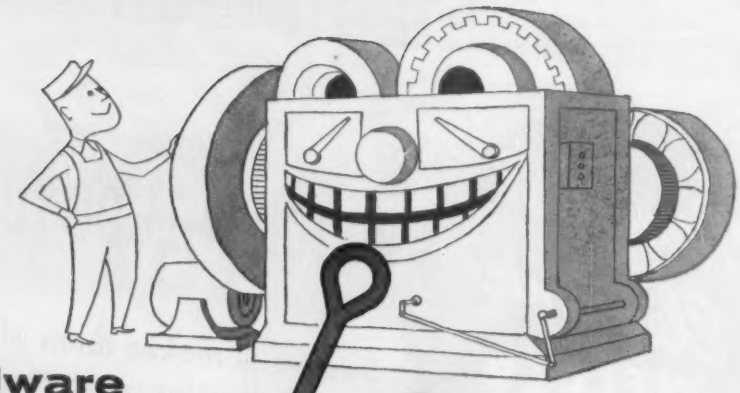
Electronic (SYNCHRONOUS)

for Precision Welding
For welding aluminum, other non-ferrous and ferrous metals requiring precision weld times; stepless heat control; slope or taper control.

CLASS 8993 Type BDG-2

You'll find your nearby **Square D Field Engineer** *a source of sound counsel in selecting the welder control best suited to your application.*

SQUARE D COMPANY

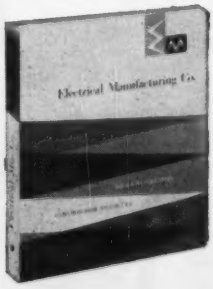


a complete line of
pole-line hardware
made and stocked to serve you
in a hurry!

Electrical Manufacturing Co. quality hardware for all your line construction needs.

Even though we're not the largest manufacturer, we are trying to be the best. We forge, machine, press and galvanize all kinds of pole-line hardware used in modern line construction. Being a smaller company really offers a big advantage to you—we are easily able to pay careful attention to details of design, fabrication and galvanizing of every part and product we're turning out. So if you are interested in not only service, but also in maximum service life, you'll find EM hardware much to your liking.

WRITE FOR YOUR COPY of this very complete, very comprehensive ringbinder catalog. It contains all the specifications of EM pole-line hardware. Simply send a letter or card to . . .



EM

ELECTRICAL MANUFACTURING COMPANY • Battle Creek, Michigan

Designers and manufacturers of pole-line hardware that saves you time, money, and maintenance. Prompt action on special problems.

STRONGER THAN THE PIN

In laboratory tests to determine the torsion strength of Kimble *Tempered* Glass Insulators, wood pins were sheared off, and lead-bushed threads stripped, with no failure of the Insulators. Cantilever tests using special alloy pins were discontinued at 10,000 lbs. with still no failure. Ultimate impact tests averaged 130 inch pounds!

Kimble *Tempered* Glass Insulators save installation time because it's never necessary to loosen for lineup with the conductor. Their great strength always allows another quarter-turn.

If it's on the pin, it's in service

Tests far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air. Even lightning surges have failed to damage them. In the event of shattering due to severe mechanical shock, insulator disintegrates into small, non-sharp fragments. Trouble shooters can locate broken insulator—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

Why not see how *tempered* glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Insulator Division, Owens-Illinois, Dept. **EW-1, Box** 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

"DESIGN OF PIPING SYSTEMS"

(Second Edition)

CONTENTS

- Strength and Failure of Materials
- Design Assumptions, Stress Evaluation, and Design Limits
- Local Components
- Simplified Methods for Flexibility Analysis
- Flexibility Analysis by the General Analytical Method
- Flexibility Analysis by Model Test
- Approaches for Reducing Expansion Effects: Expansion Joints
- Supporting, Restraining, and Bracing the Piping System
- Vibration: Prevention and Control
- History and Derivation of Piping Flexibility Analysis
- Derivation of Acoustic Vibration Formulas
- Charts and Tables

M. W. KELLOGG'S DESIGN EXPERIENCE KEEPS PACE

As temperatures and pressures increase in steam-electric power plants, the problems involved in designing, engineering, and fabricating main and reheat steam piping multiply themselves many times over. This emphasizes, more than ever, the value of the long experience, in the laboratory and on the job, of The M. W. Kellogg Company—leader in the power piping field.

More evidence of M. W. Kellogg's accumulated piping design experience and ability to tackle each new power piping project in its stride, is the company's new 400-page book, "Design of Piping Systems"—to be published shortly by John Wiley & Sons. The most comprehensive work ever made available publicly on the physical design of piping, it is one of the many ways M. W. Kellogg cooperates with consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment. An outline of contents is shown above.

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The Canadian Kellogg Company, Ltd., Toronto • Kellogg International Corporation, London

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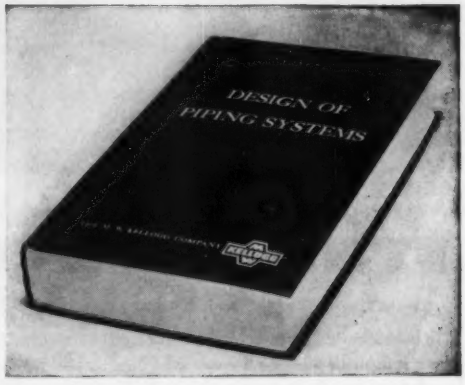
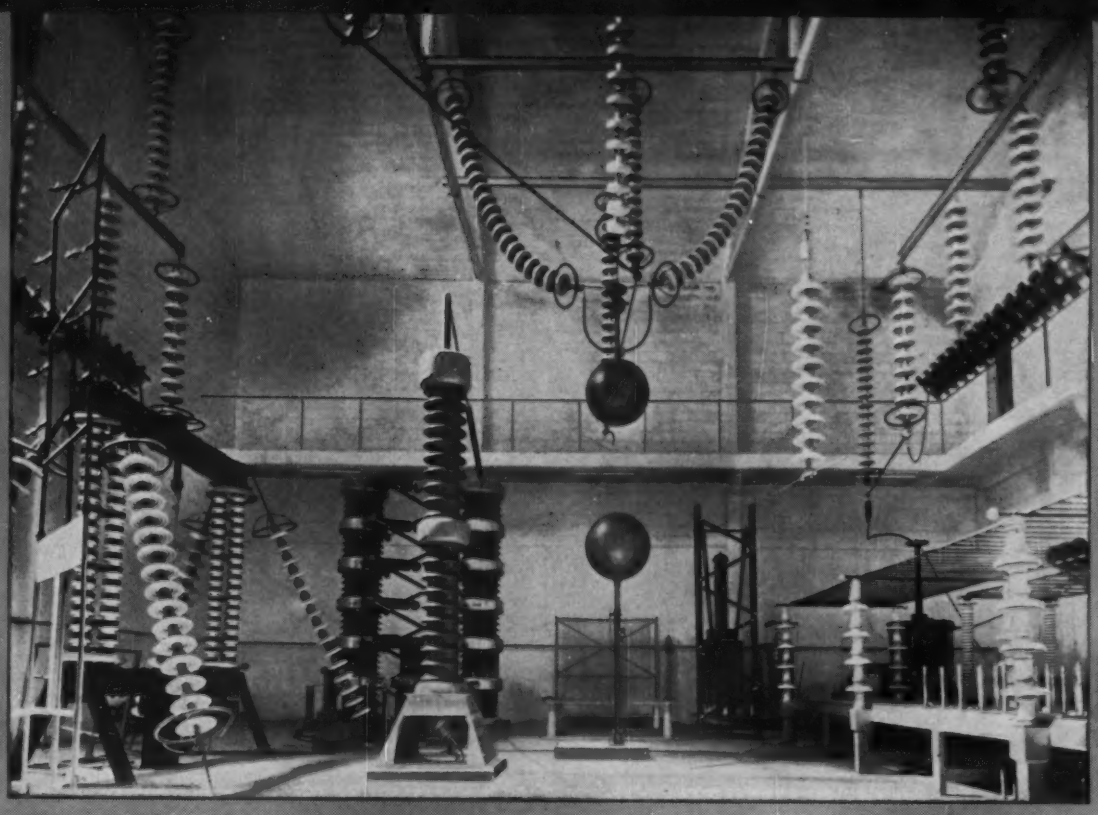


You can be sure of getting your copy of this limited edition of "Design of Piping Systems" by writing now to M. W. Kellogg, asking to be notified as soon as the book is available. Ask also for the new, free, 12-page booklet, "Piping Flexibility Analysis," which shows how M. W. Kellogg's various flexibility analyses techniques can cut piping design and construction costs.

POWER PIPING—THE VITAL LINK

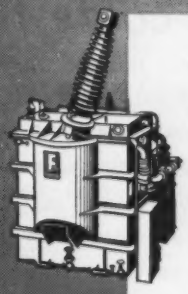
FERRANTI

HIGH VOLTAGE TESTING EQUIPMENT



ARGENTINA

A 1,000,000 volt Ferranti Impulse Generator installed in the Laboratories of Fabrica de Porcelana Armanino, Buenos Aires, Argentina.
This equipment produced the first ever 1,000,000 volt arc in Argentina. Ferranti have also supplied to the same customer a 500,000 volt, 250 kVA, A.C. Testing Equipment.



TRANSFORMER CAPACITY OF OVER 5,000,000 kVA per annum

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

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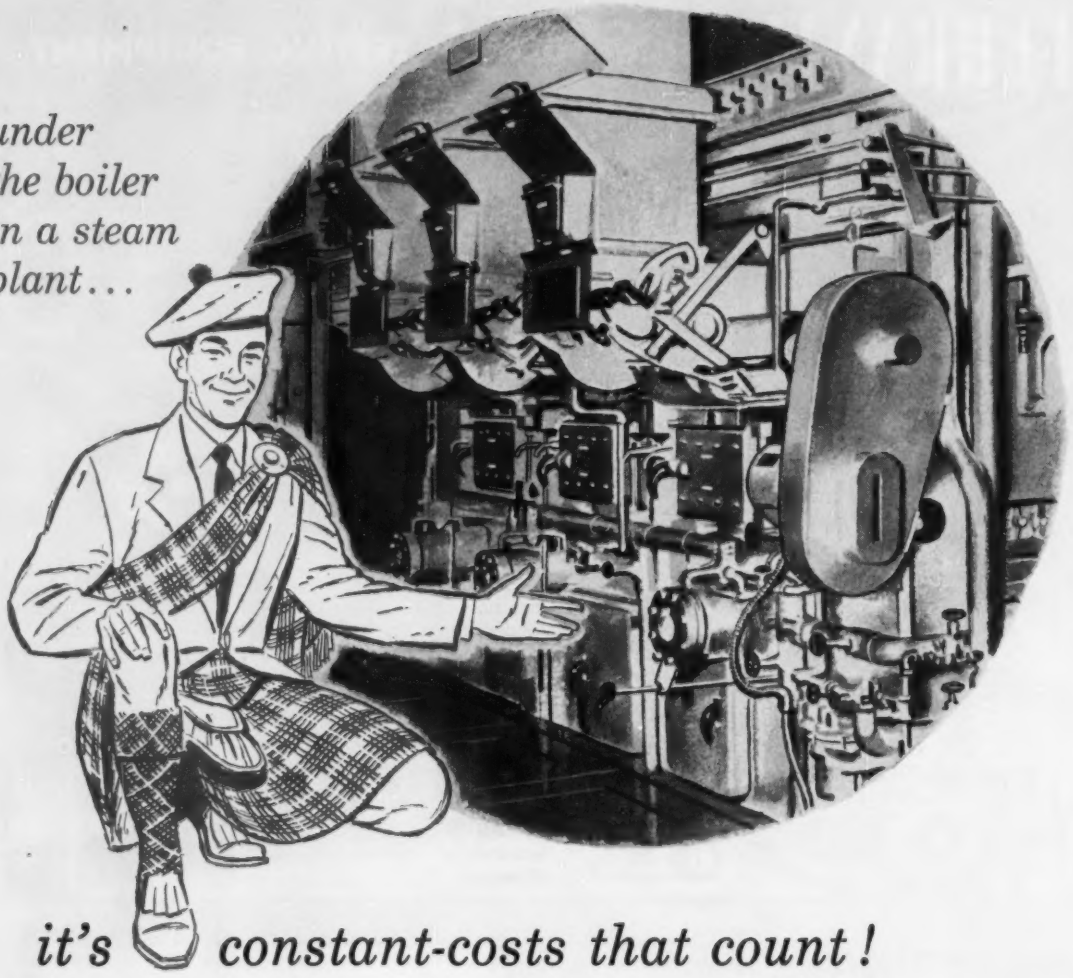
under the boiler in a steam plant...



it's constant-costs that count!

Be Thrifty! Expensive boiler installations designed to burn fuels with limited futures is doubtful wisdom. The sensible alternative is to *bank on Bituminous!* Plotting your costs over the long run will prove efficiency and lowest cost in most cases. For, Bituminous reserves are unlimited—they're nearest to most manufacturers—coal technology improves burning equipment, efficiency and cost year by year.

Let our Coal Technical Service plot a constant-low-cost Bituminous coal for your needs. *Ask our man!*

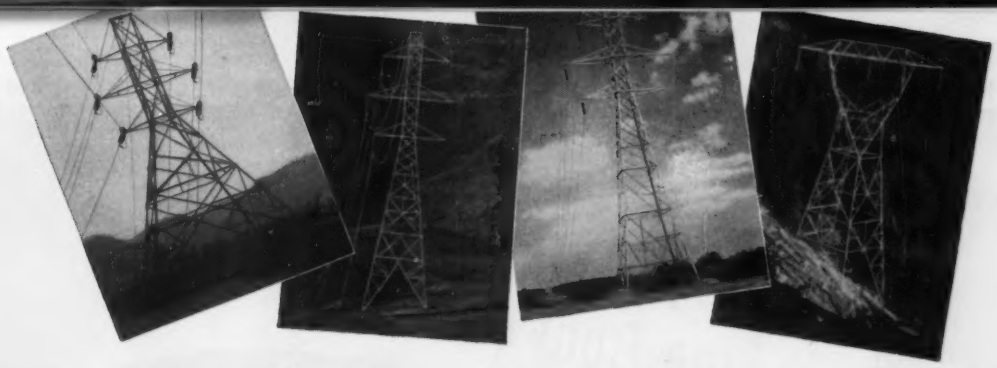
COAL TRAFFIC DEPARTMENT, BALTIMORE & OHIO RAILROAD

Baltimore 1, Maryland—Phone: LExington 9-0400

LINKING 13 GREAT STATES WITH THE NATION — B&O

BALTIMORE & OHIO RAILROAD

BITUMINOUS COALS FOR EVERY PURPOSE



How Much Does a Tower Cost?

The answer to this question is as indefinite as "How long is a piece of string?" But there are some facts that are often overlooked, and perhaps tower purchasers should ask that question. The cost of a tower is the summation of four important items, the use of any one of which without the others can be misleading.

1. COST OF TOWER DELIVERED TO YOU

Since 1911, American Bridge has operated a plant which specializes in electric transmission towers, substations and similar structures. Its modern equipment and facilities were designed specifically for that purpose, and savings accomplished assure you a quality product at the lowest possible cost.

2. COST OF FOUNDATIONS

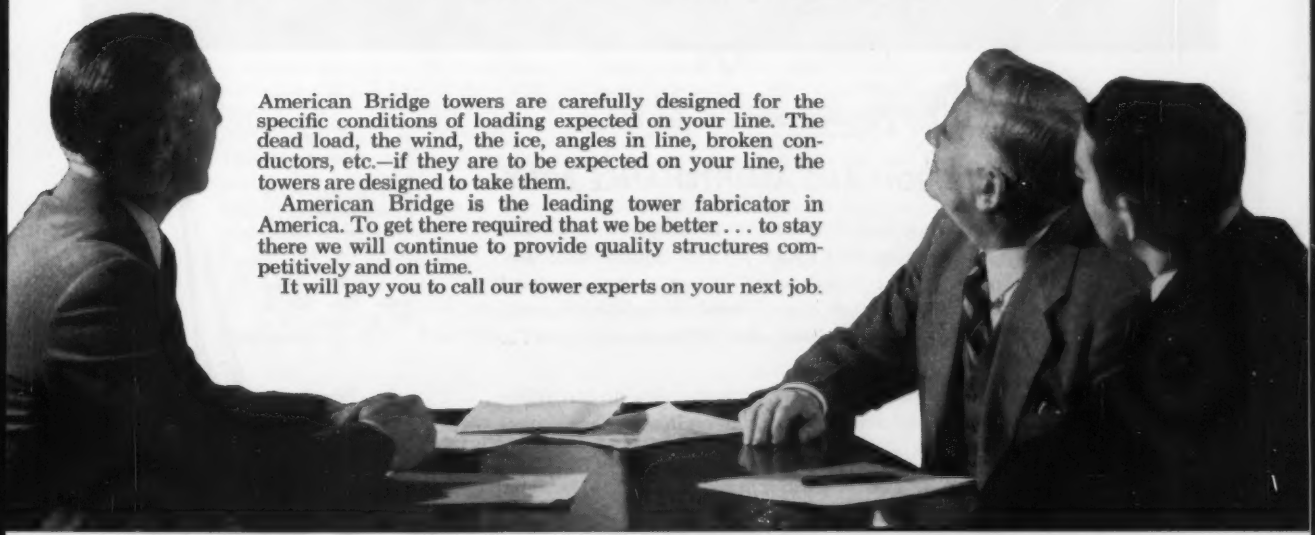
American Bridge strives to keep foundation costs low in its tower design. The rotated type tower, circular grillage and variable leg extensions are examples of how American Bridge works with its customers in a cooperative effort to reduce foundation costs.

3. COST OF TOWER ERECTION

The tower members furnished by American Bridge fit in the field. *Ask any tower erector to verify this fact.* Members are made alike on all four sides to facilitate erection. The same diameter bolts are used throughout the structure. These are sorted, packed and marked so that no time is lost looking for the right bolts for the connections; and the bolts themselves are the best obtainable. The nuts can be screwed on by hand preparatory to final tightening. Every member is stamped in the steel with its correct number to coincide with easily read erection drawings. *The fundamental reason for all this is to save you money.*

4. COST OF MAINTENANCE

All American Bridge towers are galvanized *after* fabrication by the hot-dip process. The resultant coating of pure zinc lasts for years.



American Bridge towers are carefully designed for the specific conditions of loading expected on your line. The dead load, the wind, the ice, angles in line, broken conductors, etc.—if they are to be expected on your line, the towers are designed to take them.

American Bridge is the leading tower fabricator in America. To get there required that we be better . . . to stay there we will continue to provide quality structures competitively and on time.

It will pay you to call our tower experts on your next job.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION • GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

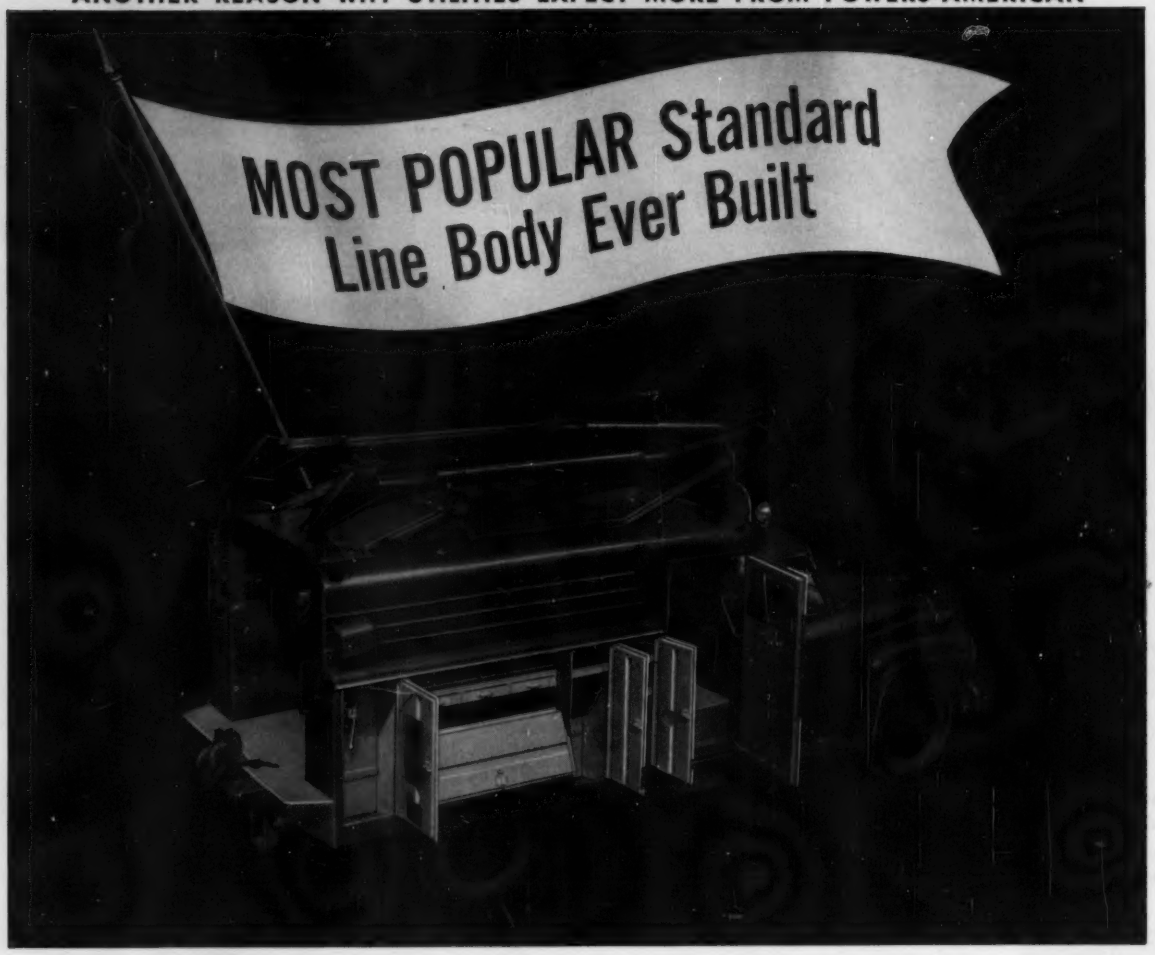
AMERICAN BRIDGE

USS

8-211

UNITED STATES STEEL

ANOTHER REASON WHY UTILITIES EXPECT MORE FROM POWERS-AMERICAN



POWERS American Series 800-C

LINE CONSTRUCTION AND MAINTENANCE BODY

"Isn't that a custom-made body?" That's what utility men often ask when they see the pace-setting 800-C. And, it's easy to understand why . . . for here's a body with more "most-wanted" features than any *standard* model on the market. Features such as partitioned sliding drawers, extra shelves, extra bins, "full-opening" doors, and 56″ wide cargo area . . . just to mention a few.

Crews really go for the 800-C crew compartment—with its easy-riding seats, adequate leg room, and well-ventilated comfort in winter or summer.

Available in lengths of 11′, 12′ 3″, and 13′. . . or without crew enclosure, in 11′ and 12′ 6″ lengths. Can be furnished with any *Pole-Master* Hydraulic Derrick or with conventional derrick equipment.

✦ Descriptive literature and prices will be sent on request

The Series 800-C Body shown here is equipped with a *Pole-Master* PM-2 Hydraulic Derrick . . . one of three different Pole-Master Derricks available in sizes for handling poles from 40′ to 75′ in length.

Powers-American Division

McCABE-POWERS AUTO BODY COMPANY

5800 NO. BROADWAY • ST. LOUIS 15, MO. 625 CEDAR STREET • BERKELEY 10, CALIF.

THOMAS *Best by line test*

new design

1 for 2

RUGGED-TYPE GROOVED STRAIN INSULATOR

This single unit does the work of *two* 6" or one 10" conventional disc-type unit and is used for dead-ending voltages up to and including 12 Kv. Its superior mechanical and electrical characteristics effect a very substantial reduction in dead-ending cost. Note the smooth lines formed by the outer edges of the corrugations and forged steel cap—no porcelain projections to receive the brunt of rough handling. If dropped, impact is distributed uniformly over porcelain and cap . . . reduces danger of breaking.

Thousands of units are giving satisfactory performance. Reports indicate that the new Thomas design is superior to any previous dead-ending unit.

Specify Thomas Catalog No. 1315 Rugged-Type Grooved Strain Insulators with full confidence that their quality and value cannot be surpassed.

Packed 12 per carton in Thomas "PACKT-TO-STACK" modern cartons. Write for prices and sample today.

Engineering Characteristics

Flashover—Dry-65 Kv., Wet-35 Kv., M & E Strength—10,000 Lbs., Leakage Distance—7½ Inches.

The R. Thomas and Sons Co.

1873 THOMAS INSULATORS our 82nd year RELIABILITY 1955

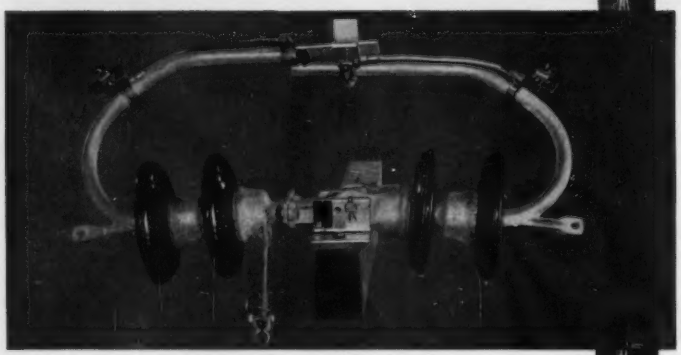
LISBON, OHIO
NEW YORK CHICAGO

Sales Representatives: **C. G. Anderson, *Chicago* • E. B. Anderson Co., *Detroit* • Ken H. Best, *Seattle* • Nellis B. Bronner, Jr., *Syracuse* • R. E. Cunningham & Son, *Los Angeles* • W. H. Eddy Electric Products, Inc., *Phoenix* • Electrical Distributors Co., *Philadelphia* • Engineer Sales Co., *St. Petersburg* • Hamilton Associates, *Denver* • Geo. E. Hann Co., *San Francisco* • Hugo Sales Co., *Minneapolis* • J. E. Johansen, *Lincoln* • J. P. Lane Co., *St. Louis* • J. O. Mann, *Pittsburgh* • Osgood & Associates, *Atlanta* • John G. Pettijohn Co., *Knoxville* • J. F. Schaefer & Co., *Kansas City* R. J. Sullivan Co., *Boston* • Walter E. Thompson Co., *Birmingham* • Triangle Electric Supply Co., *El Paso* • United Electric Supply Co., *Salt Lake City* J. H. Warrington, *Lexington* • Williamson Sales Co., *Shreveport, Amarillo, Beaumont, Corpus Christi, Dallas, Houston, Jackson, New Orleans, Pine Bluff, San Antonio* • *Representatives in other principal cities***

Compare pole top appearance!

KPF Switches

modern functional attractive



KPF Air Break Switches look different because they are different. Their pole top appearance is neat and uncluttered. There is a "straight-through" cleanliness of line—the visual appeal of design simplicity.

With this simplicity goes operating dependability and long life. There are no delicate mechanisms to malfunction, freeze, lock from cross-arm warping, need lubrication or wear out. This same simple construction also saves weight. KPF phase units weigh about the same as a comparable insulator stack. Double cross-arms and extra bracing are not needed. Installation is faster and less expensive.

KPF Switches have proved themselves in nearly a half century of major system operation. Why not get the details and make a test installation.

KPF
AIR BREAK SWITCHES
Standard for nearly half a century

For catalog and complete specifications, write direct

KPF ELECTRIC COMPANY
Dept. E, 1624 E. Alpine Avenue
Stockton 5, California

For *more dependable* Switchgear, Specify

I-T-E

For *more dependable* Insulation, Specify

NATVAR 400

EXTRUDED VINYL TAPE

↑ I-T-E MULTUMITE Switchgear is compact and efficient. It is designed and built to provide positive protection of secondary distribution systems with an extra margin of safety for uninterrupted service. Instrument transformers are designed specifically for switchboards.

Natvar 400 Extruded Vinyl Tape is used on this Type C-2, 5,000 volt, 600 amp. primary → transformer coil to protect the instrument circuit, because it has good dielectric strength, requires fewer layers than VC, is flexible enough to conform to sharp bends without wrinkling, and because it has adequate heat resistance.

Natvar

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Vinyl coated—varnished—lacquered tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 23

For more than 60 years I-T-E has been known in the electrical industry for the *quality* of its products. This reputation has been maintained through sound engineering and manufacturing skill.

Component parts and materials that go into I-T-E Switchgear are the finest obtainable, and are carefully coordinated into efficient functional units. Natvar 400 extruded vinyl tubing and tape and other Natvar flexible insulations are used because they consistently meet I-T-E's rigid requirements.

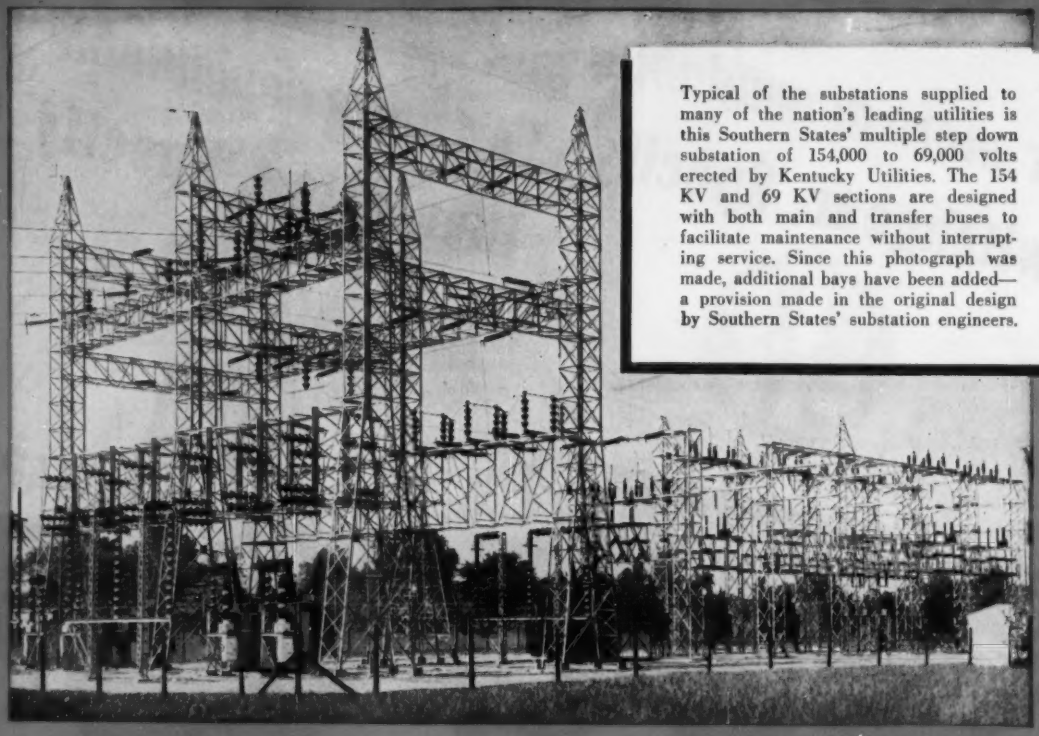
Natvar 400 and other Natvar flexible electrical insulating materials are available for immediate delivery, either from your wholesalers' stocks or direct from our own.

NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE RAHWAY 7-8800 — CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY



Typical of the substations supplied to many of the nation's leading utilities is this Southern States' multiple step down substation of 154,000 to 69,000 volts erected by Kentucky Utilities. The 154 KV and 69 KV sections are designed with both main and transfer buses to facilitate maintenance without interrupting service. Since this photograph was made, additional bays have been added—a provision made in the original design by Southern States' substation engineers.

HOW KENTUCKY UTILITIES SAVED TIME AND MONEY ON THIS SUBSTATION

When Kentucky Utilities decided to erect a multiple feeder step down substation at Paducah, Kentucky, it was as simple as one, two, three to get exactly what was needed.

One—a single-line wiring diagram and plat was sent to Southern States; *Two*—our engineers went to work and developed a design for a station that would meet immediate requirements, provide for future bays, and at the same time utilize many standard components which would result in substantial savings of both time and money; *Three*—when final plans were approved, Southern States took care of engineering, production schedules and supplied the steel structure, airbreak switches, disconnects and bus supports.

The result: an efficient, functional substation erected at great savings in time and money to Kentucky Utilities. Once more Southern States' single responsibility service in the design and production of transmission and distribution substations paid off for this progressive utility.

Your company can profit by this experience. Get full facts about this complete "3-Step Plan" from your Southern States' representative, or write direct.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

BIDDLE *Instrument News*

BIDDLE "TTR" SETS SAVE DAYS OF TIME IN TRANSFORMER TESTS

Everywhere Biddle Transformer Turn Ratio Test Sets are performing a unique service in measuring turn ratio in transformers to high precision. By means of the "TTR" Set, transformer problems are analyzed quickly and easily. In many cases, one man with a portable instrument can make an average test in less than 15 minutes wherever the transformer stands. Often, based on fault information supplied by a "TTR" test, the shop can start winding new coils before the transformer is untanked and shipped in. Users also save valuable time making acceptance tests on new transformers. Here are just a few of hundreds of companies who have profitably invested in one or more Biddle "TTR" Sets . . .

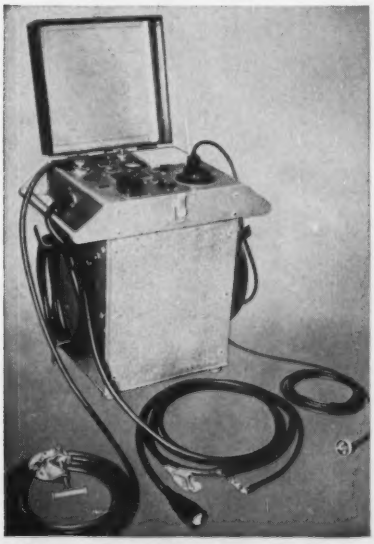
Partial List of "TTR" Users

Westinghouse • Penna. Transformer Co. • Duke Power Co. • Consolidated Edison Co. of New York • Pennsylvania Electric Co. • Detroit Edison Co. • General Electric • Philadelphia Electric Co. • Allis-Chalmers Mfg. Co. • Alabama Power Co. • Oak Ridge National Lab. • Ebasco International Corp. • Metropolitan Edison Co. • Boeing Airplane Co. • Tennessee Valley Authority • Florida Power Corp.

Write for **Bulletin 55-W.**

5 KV TRANSMITTER

BIDDLE IMPULSE CABLE FAULT LOCATING TRANSMITTER Model 5, 5 KV, 16 MUF



Those companies operating an appreciable amount of 600 volt cable should be particularly interested in this recently developed transmitter. Those having cable in the 2500 volt delta and 4000 volt wye insulation class will also find this transmitter well suited to their needs for proof testing and locating faults on important circuits. Similar applications include the proof testing and location of faults in drag cables such as used with electric shovels in strip mines. Still other applications include extensive lighting circuits such as used at airports and in highway lighting.

BIDDLE IMPULSE CABLE FAULT LOCATOR EQUIPMENT NOW INCLUDES:

Model 3, 25 KV, 1.65 MUF
Model 4, 15 KV, 2.00 MUF
Model 5, 5 KV, 16 MUF

Model 2 Detector for use with each of the Transmitters

Model 1 High Voltage Bridge and other accessories

Write for **Bulletin 65-W.**

Biddle Dielectric Test Set Model 1-40 KV

—for measuring d-c current at voltages up to 40 kv when applied to the insulation of such equipment as generators, transformers, bushings and cable.

Carefully considered safety features, excellent output voltage regulation, simple operation, compact design, and facilities for making voltage and current measurements at either polarity have been incorporated in this test set.

The set has a current rating of 25 milliamperes at short circuit, and current measurements can be made down to 0.5 microamperes which is the first division on the microammeter.

Overall dimensions are: height 19½ in., width 13½ in., depth 20 in., weight 120 lbs. All high voltage components are oil immersed.

For complete details, description, specifications, and prices, write for **Bulletin 22-W.**

James G. Biddle Co.
1316 Arch St., Phila. 7, Pa.

Gentlemen: Please send me

- ☐ **Bulletin 55-W.**
- ☐ **Bulletin 22-W.**
- ☐ **Bulletin 65-W.**

NAME

JOB FUNCTION

COMPANY

ADDRESS

B-501

JAMES G. BIDDLE CO.

1316 ARCH STREET • PHILADELPHIA 7, PA.

ELECTRICAL TESTING INSTRUMENTS • SPEED MEASURING INSTRUMENTS • LABORATORY & SCIENTIFIC EQUIPMENT

OFF WITH THE OLD...ON WITH THE NEW

The Form W transformer being hoisted off the line is one of the last of thousands like it which are giving dependable service on hundreds of distribution systems. The new design Form W transformers, shown at the left, are built to give the same dependable service, with the added advantage of being substantially smaller and lighter.

Wagner Form W Transformers are up to 17% lighter... 18% shorter

Even before the newest trend to lighter, shorter transformers, Wagner's famous Form W construction made it possible for Wagner to build small-size, light-weight distribution transformers. Now, Wagner engineers have redesigned Form W transformers in ratings 15 through 167 Kva, 15 KV and below, with improvements in core and coil construction that make possible reductions up to 17% in weight and 18% in the important overall height dimension.

For example, the old design 50 Kva transformer shown at the left weighs 895 pounds and measures 45 inches in height; the new 50 Kva transformers, also shown, are 145 pounds lighter and 5 inches shorter.

When you specify these new Wagner transformers, you can save money by putting greater transformer capacity on your existing structures. All ratings through 167 Kva can be pole mounted.

IMPROVED INSULATION A special resin coated insulating material is used for layer, channel and barrier insulation. After heat treating, the resin varnish bonds the coil conductors and insulation together to give the coils exceptionally high mechanical and electrical strength.

MECHANICAL FEATURES In the 25, 37½ and 50 Kva ratings, cooling fins increase the radiating surface. The 75, 100 and 167 ratings are provided with tubes.

The rating of each of these new transformers is clearly shown on the tank.

There are fewer sharp edges and brackets on the tank where rust can start . . . lifting lugs are curved and rounded.

These new, lighter, shorter Form W Wagner transformers will meet your requirements. Full detail are yours in Bulletin TU-180.

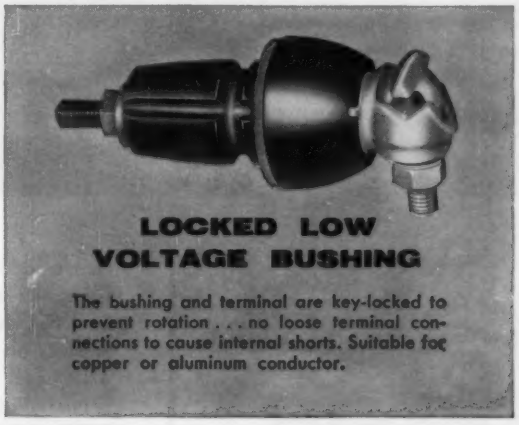
SHUR-SEAL CLAMPING RING

Keeps transformer sealed air-tight . . . no atmospheric moisture or dust particles can get inside.

HIGH VOLTAGE SIDEWALL BUSHING

For use with either copper or aluminum conductor . . . safety-designed for faster, easier connections, without tools. Porcelain and terminal are locked in position.

INHIBITED OIL—reduces oxidation to a minimum . . . retards formation of acids and sludge.



LOCKED LOW VOLTAGE BUSHING

The bushing and terminal are key-locked to prevent rotation . . . no loose terminal connections to cause internal shorts. Suitable for copper or aluminum conductor.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

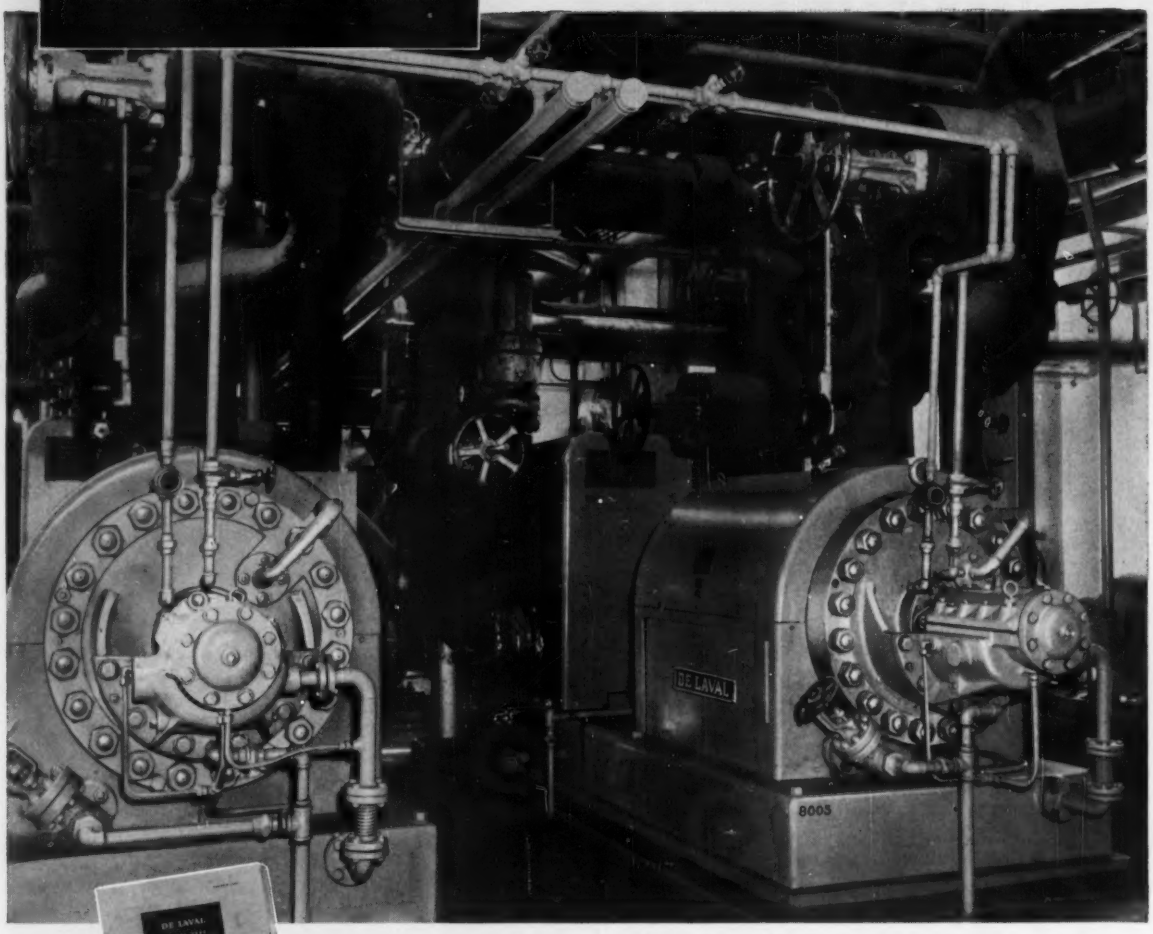
T56-1

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

DE LAVAL
BARREL TYPE BOILER FEED PUMPS

give dependable service at Gaylord Container



Bulletin contains helpful data

Bulletin 1506 on the De Laval barrel type boiler feed pump covers all major design points... has cross-section cutaway illustration for easy reference. Write for your copy.

Here's additional proof of De Laval reliability on the line in the Bogalusa, La. plant of the Gaylord Container Corporation. These two De Laval barrel type boiler feed pumps are both driven by De Laval MCP turbines operating at 850 psi, with steam temperature at 825 F.

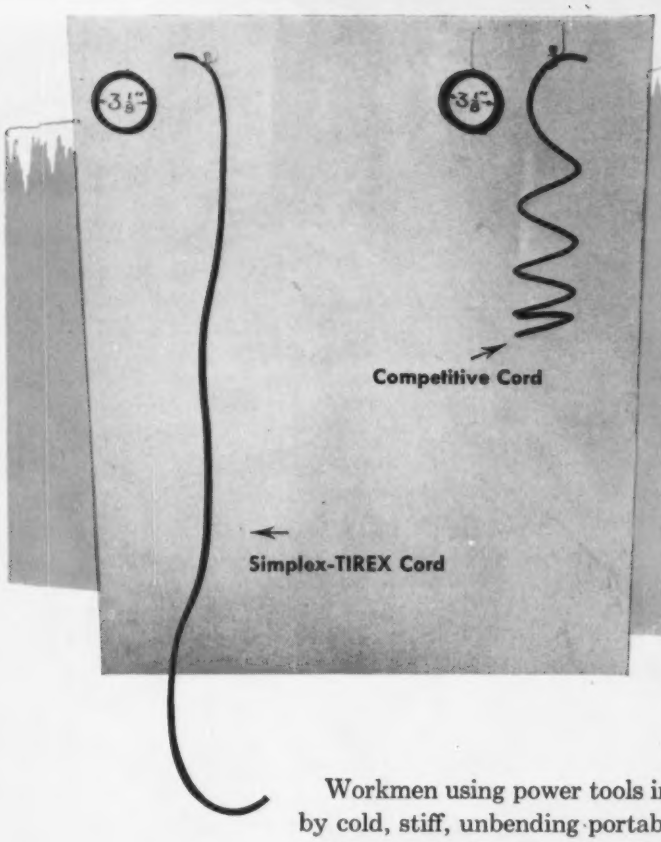
• De Laval barrel type boiler feed pumps are widely used by industrial plants and public utilities. They operate at pressures up to 5,500 psi. These units offer many important design advantages, such as double volute diaphragm, individual diaphragm bolting, positive sealing between suction and discharge chamber and bare shaft construction. Their dependability is proven by year-in, year-out service.

DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY

861 Nottingham Way, Trenton 2, New Jersey

DL 328



"Deep Freeze" tests prove Simplex-TIREX Cords stay more pliable when cold!

Workmen using power tools in winter weather find their work hampered by cold, stiff, unbending portable cords.

Recent tests show that Simplex-TIREX Cords are three times more pliable than other cords when cold.

Here is what we mean.

Two 5-foot lengths of 2-conductor No. 18 SJO cord were wrapped around a 3⅛-inch steel mandrel. One cord was TIREX and the other was a competitor's.

Both samples were locked up in a refrigerator for one month at 36°F.

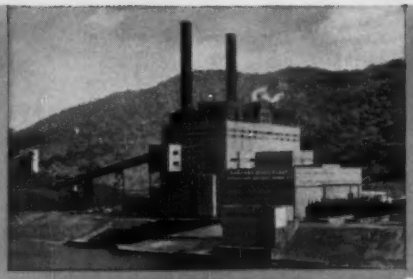
They were attached to the panel while still in the walk-in refrigerator. The panel was carried outside and immediately photographed. Notice the results. TIREX, on the left, is limp and pliable. The other cord looks like a coiled spring.

Which would you want on your portable tools? You can get genuine TIREX from your electrical distributor.

Simplex

TIREX

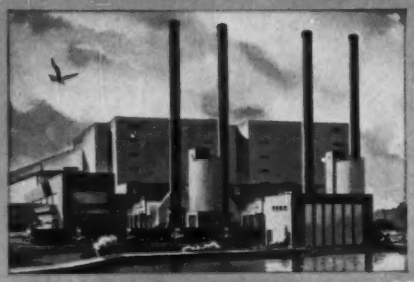
SIMPLEX WIRE & CABLE CO.
79 Sidney Street, Cambridge 39, Massachusetts



1 **KANAWHA RIVER** 9113

Appalachian Electric Power Co.
on the American Gas and Electric System

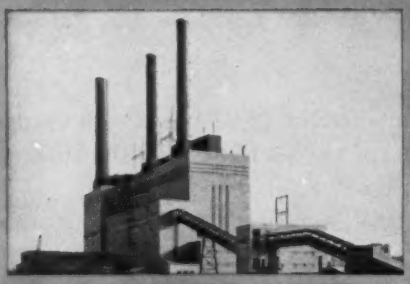
Two B&W Pressure-Fired Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.



2 **ST. CLAIR** 9240

Detroit Edison Co.

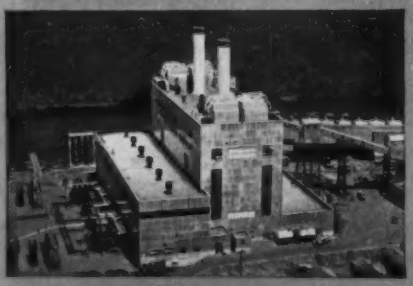
Four B&W Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.



3 **TANNERS CREEK** 9251

Indiana and Michigan Electric Co.
on the American Gas and Electric System

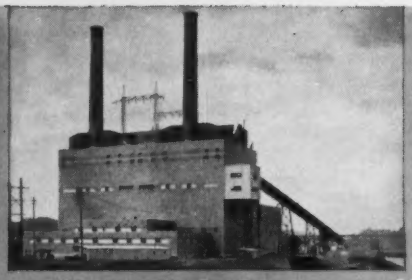
Three B&W Pressure-Fired Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.



4 **SHAWVILLE** 9310

Pennsylvania Electric Co.

Two B&W Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.



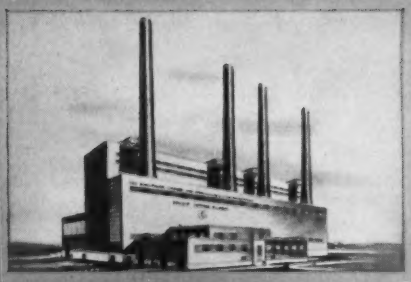
5 **MUSKINGUM RIVER** 9374

Ohio Power Co.
on the American Gas and Electric System

Two B&W Pressure-Fired Open-Pass Reheat Boilers with Gas Recirculation.

6 **EASTLAKE** 9386

The Cleveland Electric Illuminating Co.



7 **PHILIP SPORN** 9417

Appalachian Electric Power Co. and Ohio Power Co.
on the American Gas and Electric System

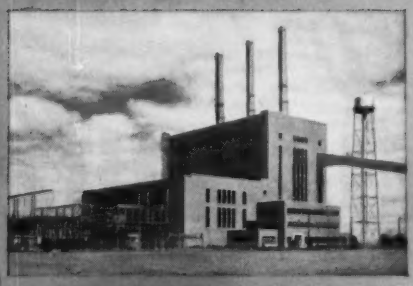
Four B&W Pressure-Fired Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.

8 **KEARNY B** 9556

Public Service Electric & Gas Co.

9 **BARRY** 9557

Alabama Power Co.



10 **JUSTIN R. WHITING** 9574

Consumers Power Co.

Three B&W Radiant Reheat Boilers.

10 BEST ANNUAL HEAT RATES

reflect INCREASING EFFICIENCY in power generation

Annual plant net heat rates of the ten most efficient central stations in the United States in 1954 — as reported by the Federal Power Commission — are led by Kanawha's record 9113 Btu per net kwhr. They are strong vindication of the foresighted utilization of major engineering advances which are taking this nation so far and so fast along the road of power generation progress. And the development of these advances has been possible only through the efforts of the electric companies and their primary suppliers working cooperatively to provide more electricity more efficiently.

In most of these leading stations, B&W Boilers designed with the most advanced features are contributing substantially toward achieving the remarkable plant efficiency levels reported. For example, at Kanawha the B&W vertically-fired Radiant Boiler units utilize:

PRESSURE-FIRING
To eliminate air infiltration, reduce stack loss and assure greater efficiency.

CYCLONE STEAM SEPARATORS
To assure positive natural circulation at high pressures with lowest auxiliary power cost, and send steam of highest purity to the turbines.

DIVIDED FURNACE CONSTRUCTION
To hold building volume to the minimum while achieving required furnace cooling surface.

Just behind the ten leaders are more plants — many with B&W Units — producing abundant, economical power in all parts of the country.

Welcoming its responsibilities as a major supplier, B&W continues to apply the knowledge derived from almost a century of boiler engineering, design and fabrication experience. And to help foresee the needs of the future, the practical results of an extensive B&W program of research and development are continuously being enlisted in the efforts to achieve still higher levels of steam-electric generating efficiency.

G-738

BABCOCK & WILCOX

BOILER DIVISION

Taps tight.... can't freeze!

Fully sealed grease chamber prevents corrosion
Heavy stainless steel spring washer compensates for expansion and contraction ... prevents loosening.
Sure-Lok clampstick for installing clamps at extreme angles

KEARNEY
Protected-Thread
CON-NEC-TAP CLAMPS

Months or even years from now, Con-Nec-Taps are as easy to take off as they were to tap on, because the screw threads are completely enclosed in a grease-filled chamber. You'll never need to cut these clamps off the line . . . in fact, you'll save by being able to use them over and over again.

A heavy, double-coil spring washer resists vibration and compensates for expansion or contraction. You are sure of a high-pressure contact under all conditions. Kearney Con-Nec-Tap Clamps are available for all types and sizes of conductors.

New Process Plastic Pole Coating:

KEARNEKOTE* tough, high-dielectric plastic is bonded directly to the wood of KEARNEY Live Line poles.

*Registered Trade Mark. 278R

For Better Construction...Safer Maintenance

Specify **KEARNEY PRODUCTS**

JAMES R. KEARNEY

The Mark of Quality

JAMES R. KEARNEY CORPORATION • 4224-42 CLAYTON AVENUE, ST. LOUIS 10, MISSOURI • Canadian Plant: GUELPH, ONTARIO

Specially shaped porcelain disk, flashing over at 67,500 Volts

The Shape of Things to Come

Coming...440 KV...500 KV transmission systems!

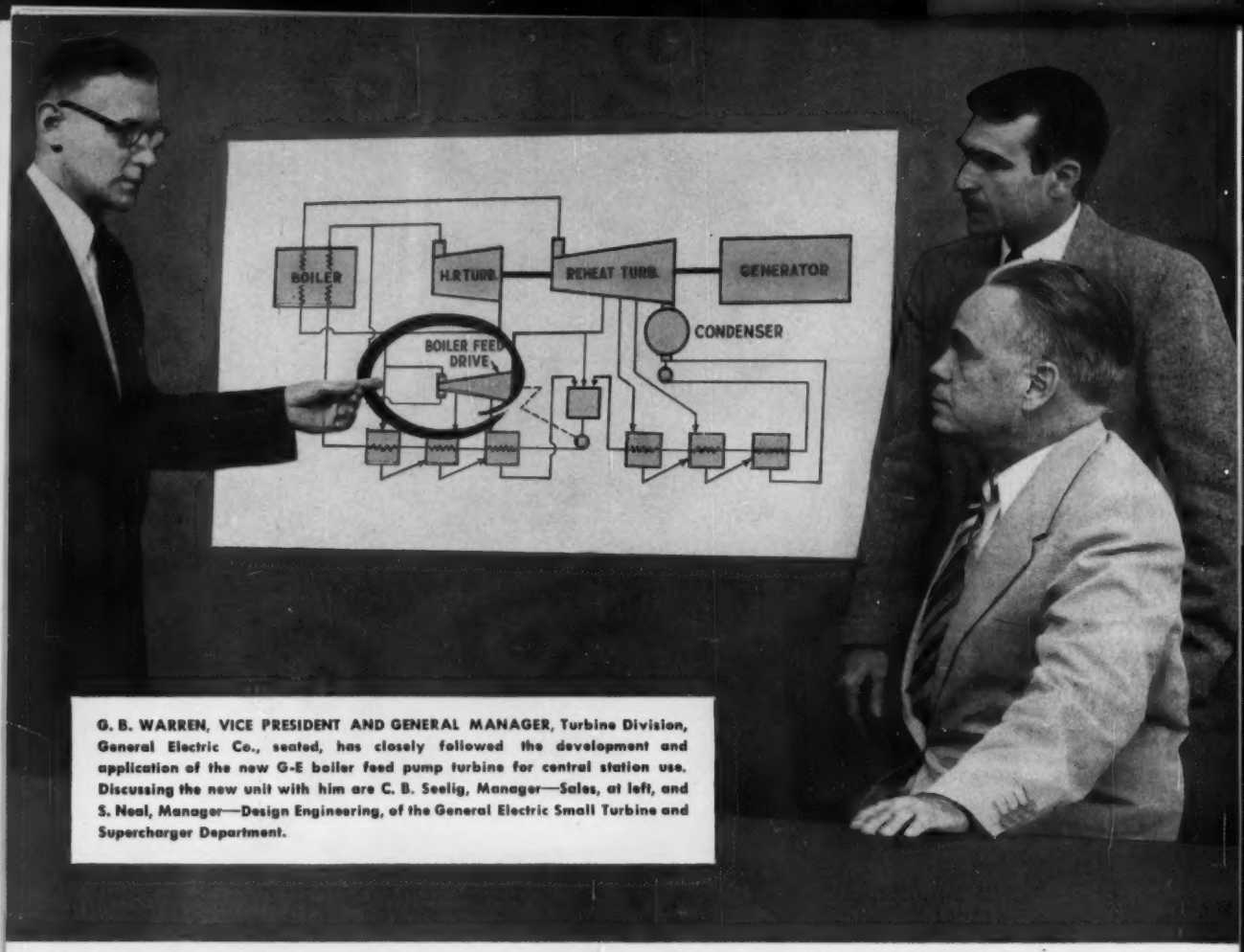
Who knows how insulators will behave at such voltages? Is it possible that presently accepted insulator shapes should be revised in view of special demands made by voltages of 400,000 and up?

It's our job to find out . . . and that's what we have been doing in our High Voltage Laboratory. In this case, we are re-examining the whole concept of insulator shape.

We are asking ourselves this . . . and many other provocative questions, as part of our constant search for new information on high voltage insulation problems. It is part of our service to the electric power industry.

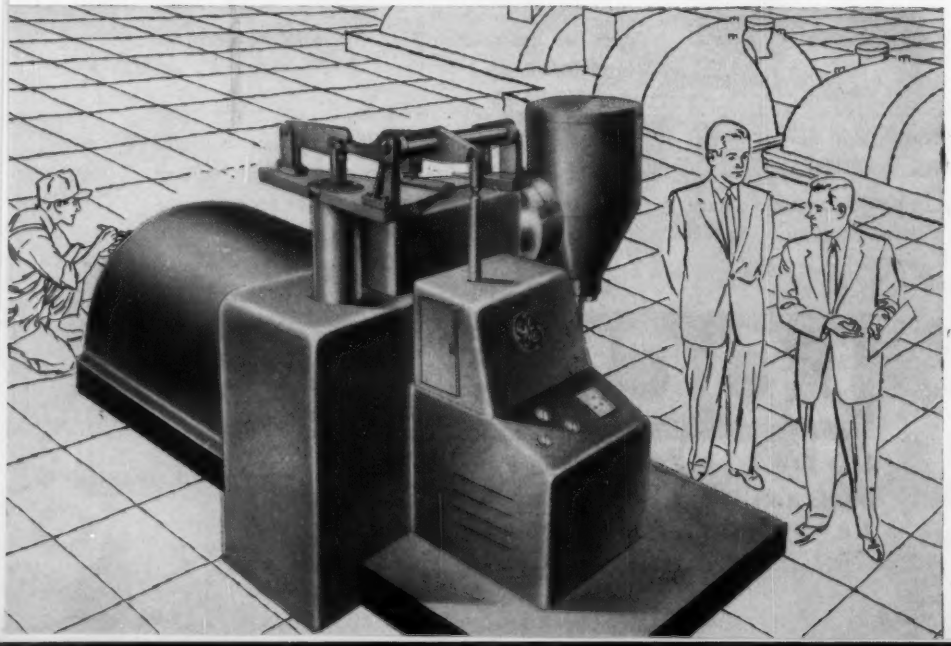
LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND



G. B. WARREN, VICE PRESIDENT AND GENERAL MANAGER, Turbine Division, General Electric Co., seated, has closely followed the development and application of the new G-E boiler feed pump turbine for central station use. Discussing the new unit with him are C. B. Seelig, Manager—Sales, at left, and S. Neal, Manager—Design Engineering, of the General Electric Small Turbine and Supercharger Department.

FOR THIS PARTICULAR APPLICATION ARRANGEMENT the high-speed turbine taps steam from the cold reheat line and exhausts to the heating system of the main turbine. By directing the exhaust from the boiler feed pump drive turbine to the main feed-water heating cycle, good plant heat rates are achieved under normal loading conditions. Since the reheater flow is reduced, savings may be achieved in reheat piping. During start up and light load operation, steam from the main boiler is admitted through auxiliary valving to the boiler feed pump turbine.



THIS TURBINE CAN INCREASE YOUR NET SALABLE KILOWATTS. It is one of a new line of General Electric turbines for driving boiler feed pumps in the 4000- to 10,000-hp range at speeds up to 9000 rpm.

HIGH-SPEED TURBINES

Announcing...

The NEW General Electric High-speed Turbine for Boiler Feed Pumps

GENERAL ELECTRIC has developed **a new turbine** especially designed to drive boiler feed pumps. This is the result of a thorough study which proved that such a turbine can bring significant advantages to electric utilities.

Because of today's trend toward increasingly higher pressures in high-output steam-electric generating plants, General Electric feels that mechanical-drive turbines can now be economically justified as boiler feed pump drives. Feed pumps for such plants now require 5000 to 10,000 hp at high speeds.

THE VARIABLE-SPEED CHARACTERISTICS of turbines are also particularly adapted to boiler feed pump control. This new concept in power station engineering is practical from both an operational and economical standpoint.

HERE IS HOW STEAM STATIONS CAN PROFIT using these new G-E turbines: Auxiliary power normally supplied by the main generator for motor-driven feed pump drives can now be released as salable kilowatts. This increase in salable power is available at relatively little incremental investment.

This design, the latest addition to General Electric's complete line of high-speed turbines, is built for easy operation and highly reliable service. Several utilities have already purchased a number of these units.

THE SCHEMATIC DIAGRAM shows one way in which G-E boiler feed pump turbines can fit into a typical steam station system. For additional information on how these turbines can be applied in your specific plant, contact your nearest G-E Apparatus Sales Office or write General Electric Company, Small Turbine and Supercharger Department, Fitchburg, Mass. 24-4

Progress Is Our Most Important Product

GENERAL ELECTRIC

CRESCENT UNIVERSAL PLIER.
D27, 7" only.

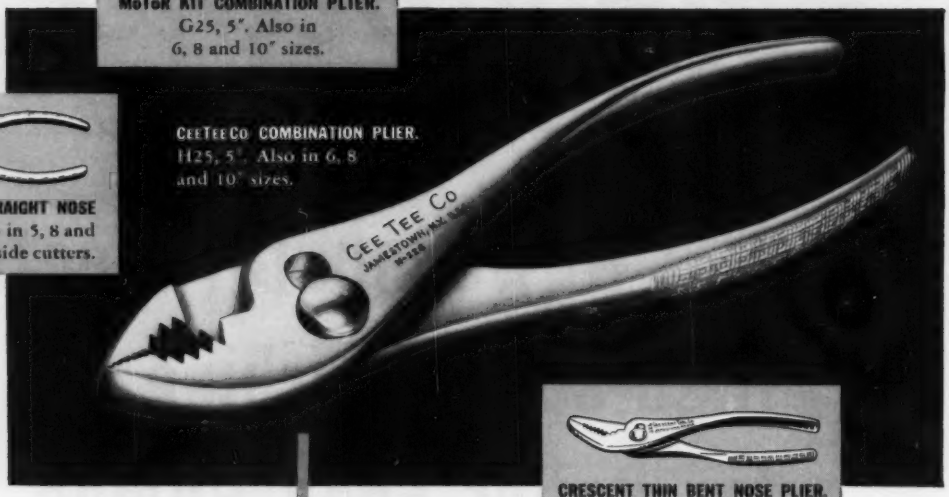
There's a

CRESCENT SLIP-JOINT PLIER

for every job!

MoToR KIT COMBINATION PLIER.
G25, 5". Also in 6, 8 and 10" sizes.

CRESCENT THIN STRAIGHT NOSE PLIER. L26, 6". Also in 5, 8 and 10" sizes and with side cutters.

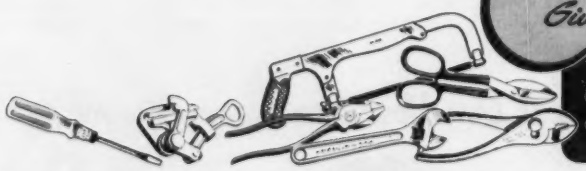


CEETEECO COMBINATION PLIER.
H25, 5". Also in 6, 8 and 10" sizes.

CRESCENT THIN BENT NOSE PLIER.
J26, 6" only.

● Crescent offers a wide selection of styles and sizes in this widely used plier type. All are drop-forged from special analysis steel and finished in bright plate. They have sharply milled teeth, comfortable handles and smooth working joints. The joint bolt and nut are turned from solid bar steel and case hardened. You simply can't find better pliers anywhere.

CRESCENT and CRESTOLOY TOOLS are sold by hardware dealers and industrial distributors everywhere. Look for the bright yellow Crescent Display panels and select from one of the world's greatest assortments of quality hand tools.



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CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

BLACKBURN *Hi-Strength* CONNECTORS

Make BETTER Connections — HIGH PRESSURE Connections!

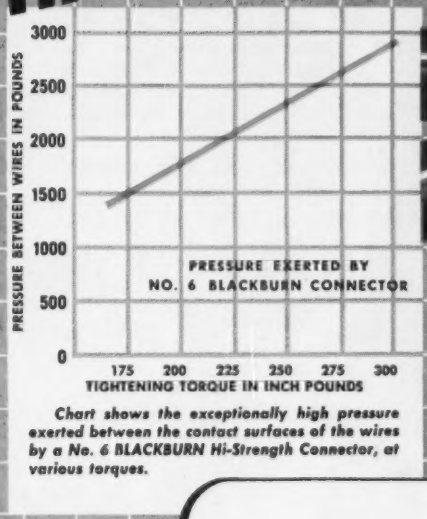

Chart shows the exceptionally high pressure exerted between the contact surfaces of the wires by a No. 6 BLACKBURN Hi-Strength Connector, at various torques.

Listed by Underwriters

HIGH PRESSURE Connections Are BETTER Connections

High pressure increases the contact area between the wires, effectively seals the contact surfaces from moisture and oxidation, and produces a lasting, low-resistance connection.

BLACKBURN Connectors Make Lasting High Pressure Connections because:

(1) They are made with the right combination of alloys — high strength alloys — to reduce frictional losses in the threads.

(2) They are made with smooth-cut threads, to increase their efficiency. These two factors insure more of the tightening torque being converted to "pressure between wires".

(3) Their corners and edges are all rounded, so that the high pressure cannot injure the wires.

(4) They actually test stronger than other connectors when pulled to destruction in a tensile-testing machine. This means that BLACKBURN Connectors have that extra strength required to maintain the high "pressure between wires" without stretching and loosening.

(5) The coefficient of expansion of the alloys used is substantially equal to that of copper. A temperature change of 100° F results in only 1% change in the "pressure between wires".

Yes, BLACKBURN Hi-Strength Connectors definitely make *better connections — for your protection!*

JASPER BLACKBURN CORPORATION

35 Madison St., St. Louis 6, Mo. **Phone MAin 1-2821**

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ELECTRICAL CORDS HAVE
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Electrical Wire and Cable Department

United States Rubber

here's why GrateLite* is great!

eye comfort you can measure
300 F.C. with only
1.11 C.P./Sq. In. Brightness

and here are the figures to prove it . . .

Foot-Candles, Efficiencies, Brightness Readings

In our own showrooms we've installed a 15' x 16' GrateLite Ceiling. By switching on various lamp arrangements we can deliver from 28 to 300 foot-candles 7' 9" below the GrateLites. Measurements at right give GrateLite efficiency figures and brightness readings at 30° and 45° below the ceiling.

THESE FIGURES PROVE GRATELITE in a class by itself for modern high intensities, safely within comfort ranges plus a high degree of diffusion.

AREA: 15' x 16' (240 Sq. Ft.)
GRATELITES: Suspended 16" below ceiling
FT.-CANDLES: Taken 7' 9" below GrateLite
BRIGHTNESS READINGS: Taken with [illegible] Meter
LUMINAIRES: Guth 36-5385/TO
ROOM COLORS: 3 walls—light green—[illegible] Floor—15% R. F.

Lamps No.	Size, 48" C. Lamps & M.A.	Total Lamp Watts	Foot-Candles With GrateLite	Foot-Candles Lamps Exposed	Efficiency With GrateLite	Brightness at 30° C.P./Sq. In.	Brightness at 30° Foot-Lamberts	Brightness at 45° C.P./Sq. In.	Brightness at 45° Foot-Lamberts
2	2 @ 200	80	28	43	65%	30	0.13	22	0.11
4	4 @ 200	160	56	86	65%	60	0.25	44	0.22
6	6 @ 200	240	84	129	65%	90	0.38	66	0.33
8	8 @ 200	320	112	172	65%	120	0.50	88	0.44
10	10 @ 200	400	140	215	65%	150	0.63	110	0.55
12	12 @ 200	480	168	258	65%	180	0.75	132	0.66
14	14 @ 200	560	196	301	65%	210	0.88	154	0.77
16	16 @ 200	640	224	344	65%	240	1.00	176	0.88
18	18 @ 200	720	252	387	65%	270	1.13	198	0.99
20	20 @ 200	800	280	430	65%	300	1.25	220	1.10
22	22 @ 200	880	308	473	65%	330	1.38	242	1.21
24	24 @ 200	960	336	516	65%	360	1.50	264	1.32

*T. L.—Foot Lamberts C. P.—Candlepower *Reg. U. S. Pat. Off.

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Leaders in Lighting since 1902

Lapp Builds the

. . . to give extra years of operating

Shipments today of Lapp Line Posts are at an all-time high. Most of them are going to companies which bought their first Lapp Line Posts fifteen, twenty, even twenty-five years ago. On the record, the performance of these earliest Lapp Posts (and all since)—has never been approached by any other line insulator. There are good reasons for such a record—the original idea of a Post as an insulator designed to take advantage of the *strength* of porcelain (rather than to impose on its weakness)—and *the way Lapp builds* the Post, which assures in service every promise in theory ever made for it.

Lapp Insulator Co., Inc., Le Roy, New York.

NO CONDUCTIVE GLAZE • Lapp Line Post *by design* is free of radio and TV interference. No corona is formed at operating voltages, so no "treatment" is required.

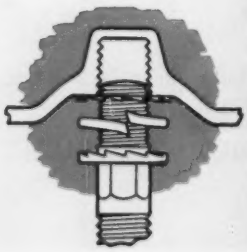
ONE PIECE PORCELAIN BODY • Porcelain is ten to twenty times as strong in compression as it is in tension. Lapp Post design eliminates nested porcelain parts, pins or other inserts, avoids internal strains. Stiffest under deflection.

FOG-TYPE LEAKAGE CORRUGATIONS • Multiple petticoats provide extra leakage distance and uniform leakage path; spaced for natural cleaning—wind and rain flush off contamination, keep surface resistance high.

SMALL DIAMETER • Lapp Line Post gets its flashover and leakage values from height rather than spread; easy for use with hot line tools.

SHORT, STURDY PETTICOATS • Maximum protection for insulator body under impact and flashover.

HARDWARE EXTERNALLY ATTACHED • Bases (and caps on Clamp-top Lapp Line Posts) are cemented ON. Porcelain is loaded only in a large-area low intensity compression grip.



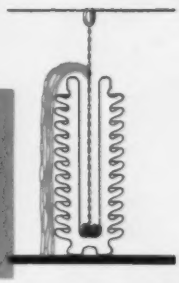
INTERCHANGEABLE STUD BOLTS • Easier stock inventory—separable long or short studs may be installed in the field. A positive lock washer, cooperating with serrated surfaces in insulator base and stud, permits easy removal, but locks stud against line vibration.

Line Post

security

LARGE CONDUCTOR GROOVE • Square-side top grooves meet new EEI-NEMA standards—provide for conductors of diameters up to 1 ½".

EASY TYING • Conductor groove, side groove and lip designed for fast, secure tie-wire attachment.



SOUND PORCELAIN • 100% electrical test before plugging or assembly—3-minute 60 cycle flashover from chain dropped entire depth of hole in inverted porcelain—assures soundness of head, soundness of whole porcelain.

INSIDE GLAZED • All Lapp Post porcelains are glazed inside and out—an extra-quality feature that makes for added cleanliness and more critical visual inspection.

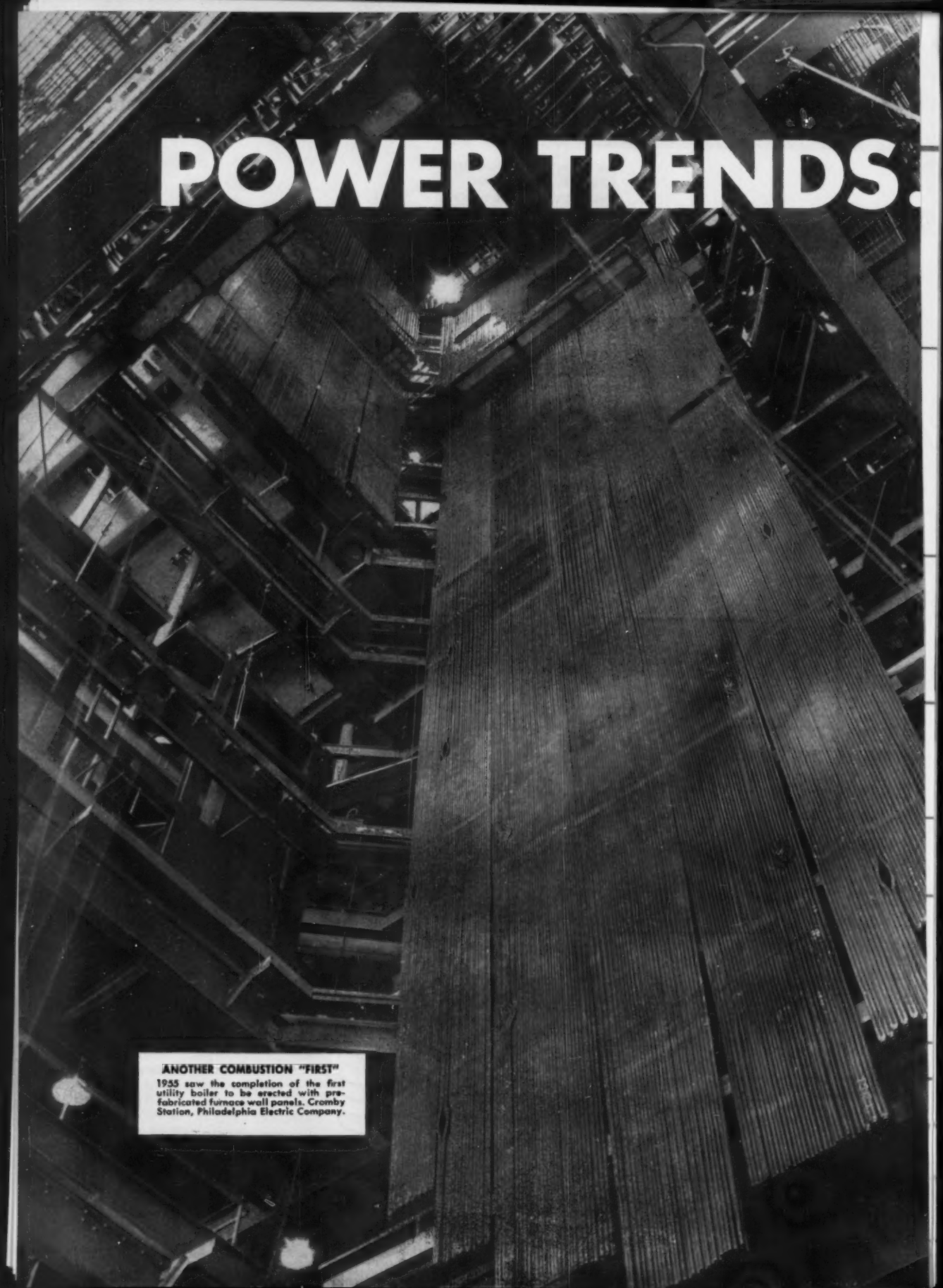
LIVE TERMINALS are separated by full length of the insulator. Loss of one or more petticoats does not reduce flashover distance.

PORCELAIN and RUBBER PLUG • This Lapp design, unchanged for 20 years, assures a permanently clean, dry hole, prevents internal conductive contamination.

EASIEST CLAMP-TOP TO USE • Four sizes of clamps (interchangeable on all Lapp Clamp-top Line Posts) provide for all conductor sizes .25" to 1.50". Conductor installed without removing keeper; only one loose bolt (with captive lock washer) for complete installation. Great for hot-line work!

Lapp

POWER TRENDS...



ANOTHER COMBUSTION "FIRST"

1955 saw the completion of the first utility boiler to be erected with prefabricated furnace wall panels. Cromby Station, Philadelphia Electric Company.

... as revealed by 1955 orders for **C-E UTILITY BOILERS**

Orders placed for C-E Utility Boilers in 1955 were of such volume and diversity as to provide a comprehensive picture of present-day practices and trends in the power field. The total capacity represented by these orders was more than

7,000,000 kilowatts

Reheat boilers accounted for over 90 per cent of this capacity. Since the use of reheat has become almost universal practice with respect to medium size and larger units, the following comments on trends are based on orders for *reheat boilers only*.

UNIT CAPACITIES – Bigger turbine-generators continue to be the order of the day. Average capacity is about 148,000 kw. Eight units are rated at 200,000 kw or higher, the two largest being 325,000 kw.

STEAM PRESSURES – Most notable trend is growing adoption of 2400-lb range. Twelve units, representing 31% of the capacity, are in this category. 1955 orders also included one supercritical pressure unit – 3500 psi. Units from 2000 psi up represent nearly 60% of the capacity.

STEAM TEMPERATURES – Almost 45% of the units will have primary steam temperature of 1050 F and one unit will be designed for 1100 F. These units account for 55% of the capacity.

CONTROLLED CIRCULATION – Continuing its dominant position in the high pressure field, C-E Controlled Circulation designs accounted for 73% of all C-E reheat capacity ordered last year and 100% of the capacity for pressures from 2000 psi up.

FIRING – 87% of the capacity will be fired by C-E Tilting Tangential Burners. Coal stays well out in front as the No. 1 utility fuel, being specified as the primary or exclusive fuel for nearly 75% of the units. However, virtually all these units, whether the primary fuel be coal, oil or gas, will be designed for easy convertibility to the use of other fuels.

DUAL FURNACES – Completely separated furnaces will be used for 20% of the units, including all units from 200,000 kw up. (Nine C-E dual furnace units are now in service and six more, ordered prior to 1955, are in process.)

COMBUSTION ENGINEERING

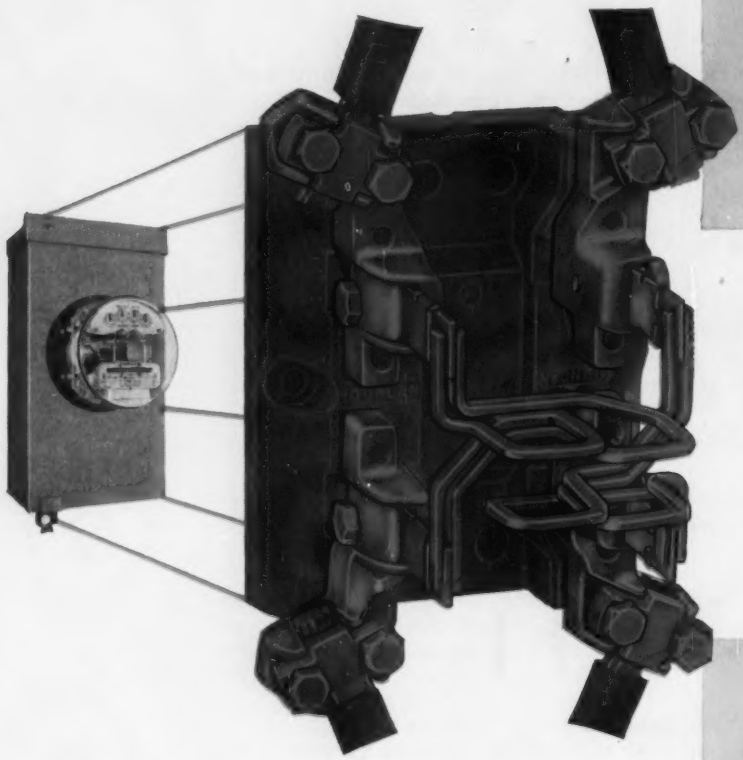
Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

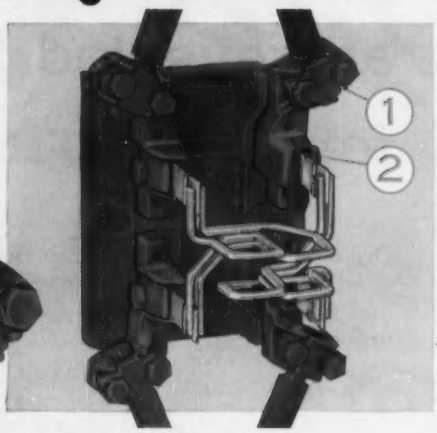
STEAM GENERATING UNITS; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; HOME HEATING AND COOLING UNITS; DOMESTIC WATER HEATERS; SOIL PIPE

B-900

EXPERIENCE HAS PROVEN—

200-AMP "Extended Range Metering" Can Cut Costs!

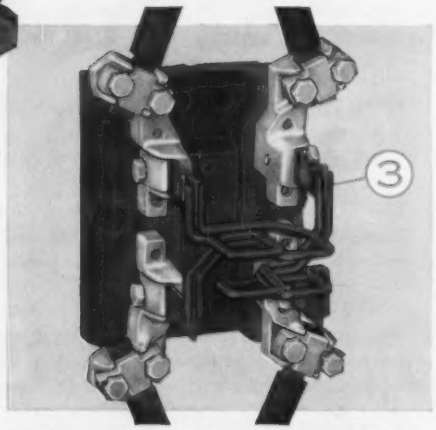




DUNCAN

Heavy Duty Mounting Devices and Extended Range Meters

1. **Massive bronze connectors have 2-bolt clamps for conductors up to 4/0.**
2. **Mounting device is equipped with vise-jaw clamps for meter terminals.**
3. **Duncan meter current coils have added copper for 200-amps capacity. Screw joints are eliminated.**



THE elimination of current transformers on loads up to 200 amps, by the use of self-contained metering equipment, stems from developments originated over a number of years by Duncan. Today, extended range metering has widespread acceptance in all sections of the country and is providing substantial savings in installation cost, space, and time. Duncan offers a complete line of extended range meters and mounting devices for all types of services — singlephase or polyphase — watthour or demand.

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Pioneers in Extended Range Metering

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TYPE G ROECLAD CABLE – with ground wires – for service to 5000 volts.

TYPE W ROECLAD CABLE – without ground wires – for service to 2500 volts.

TYPE SH-A, B, C or D ROECLAD CABLE – shielded, with or without ground wires – for voltages above 2500 – made in four different applications of shielding and ground wires.

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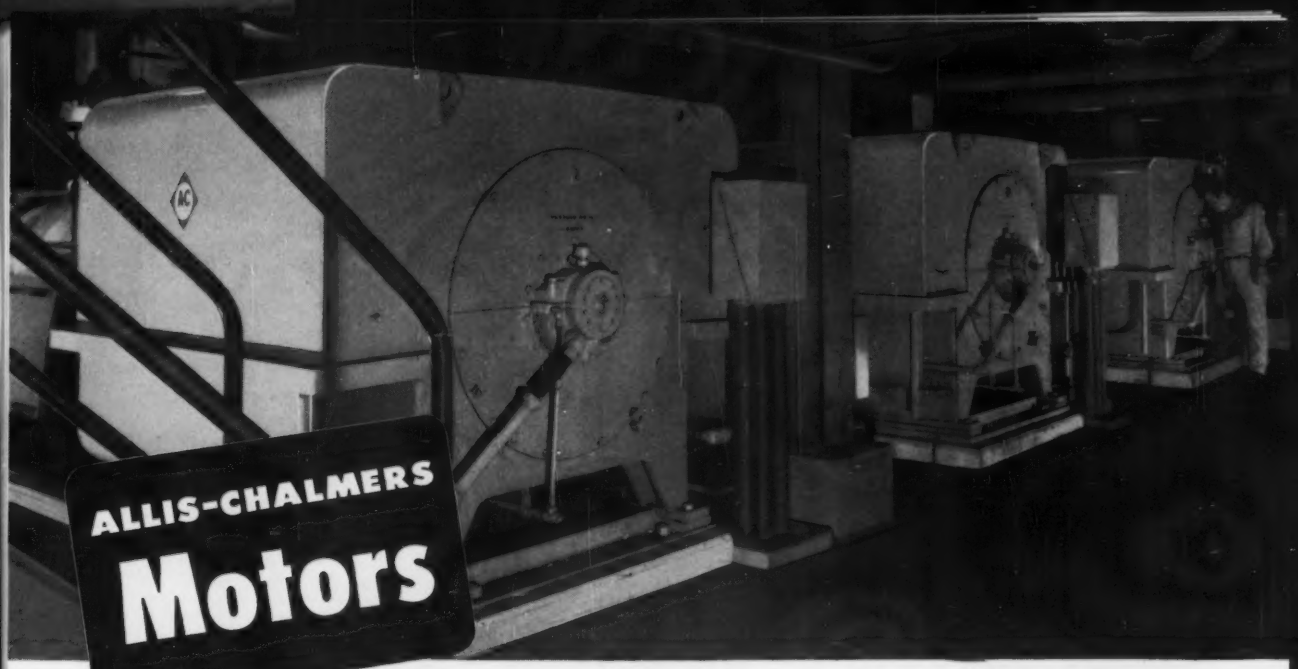


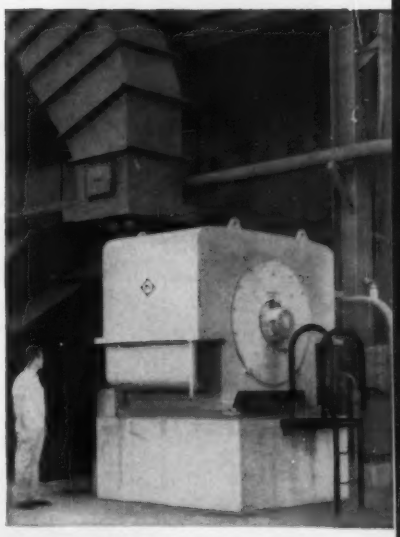
Driving ALL Major Auxiliaries

at Houston's New Webster Station

Weather-protected Allis-Chalmers motors are used throughout the modern outdoor Webster Station of Houston Lighting and Power Company. They provide low-cost outdoor installation plus dependable operation under all weather conditions.

These motors are but a few of the complete line of motors Allis-Chalmers builds for power plant service. Check with the A-C office in your district or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin. A-4832

Three of the six 1750-hp, 3575-rpm, 2300-volt Allis-Chalmers two-pole motors providing unusually quiet drives for boiler feed pumps.



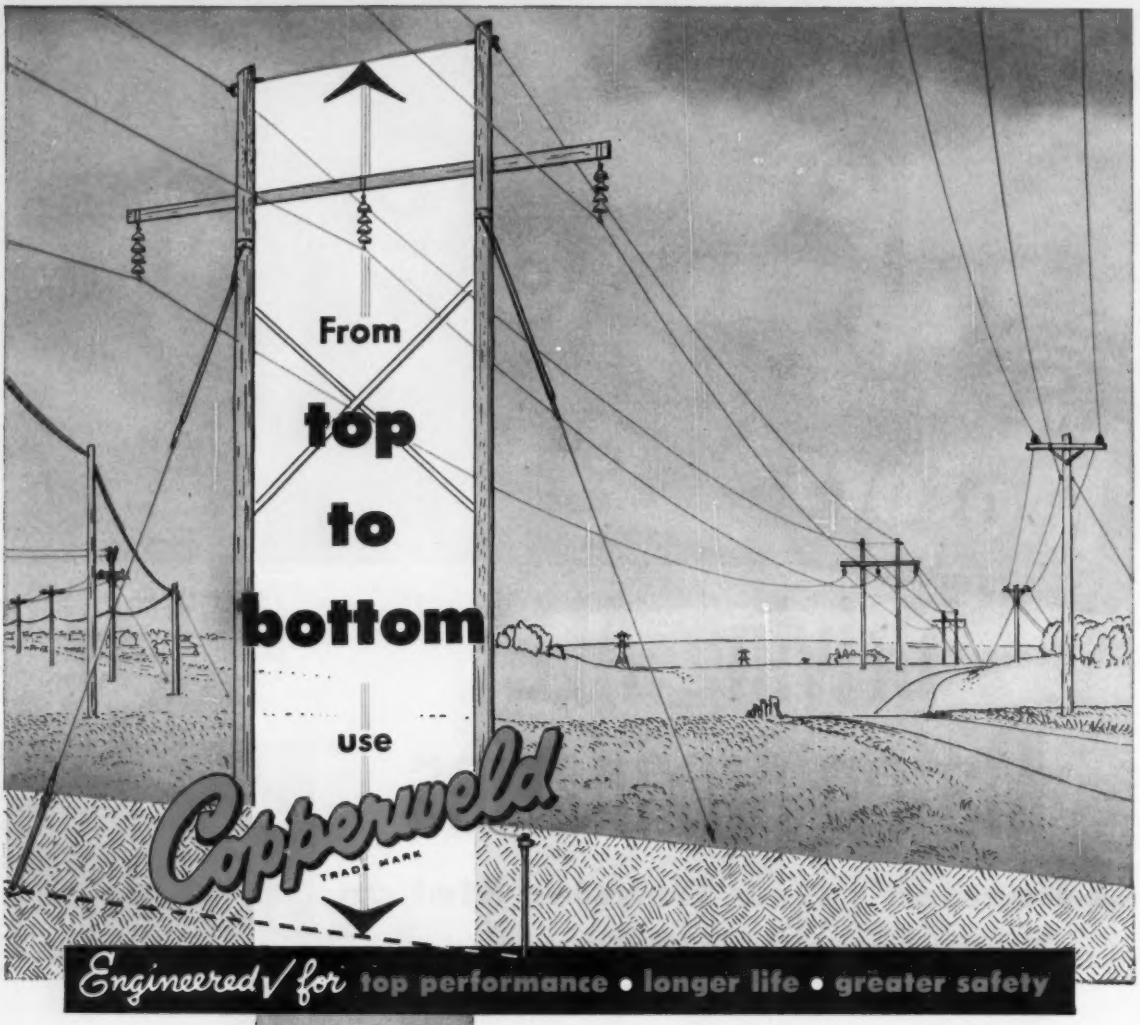
Two 350-hp, 1170-rpm, 440-volt Allis-Chalmers condensate pump motors.

One of four 1250-hp, 880-rpm, 2300-volt cage motors driving forced-draft fans.

ALLIS-CHALMERS

Four 800-hp, 514-rpm, 2300-volt vertical Allis-Chalmers circulating water pump motors.

Engineers and Constructors —
Ebasco Services Incorporated



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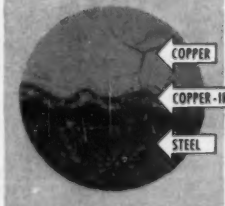
counterpoise wire ✓
anchor rods ✓

What Copperweld's MOLTEN-WELD means to you!

The perfect, inseparable union of copper and steel—as indicated by this photomicrograph of the Molten-Weld—assures rugged strength, high conductance, rust resistance and long life. Only Copperweld Products offer this unique combination of advantages.



As many of the world's leading power companies well know, it's good engineering to use Copperweld* Products all along the line—from top to bottom. And it's sound economics, too, because Copperweld Products are unequaled for long life and low maintenance. At the same time, they provide the utmost in dependability and safety, thus assuring fewer service interruptions, increased revenue. Remember—when you specify Copperweld, you get the strength of steel plus the conductivity and permanence of copper. Engineering data is available upon request.

*Trade Mark

COPPERWELD STEEL COMPANY
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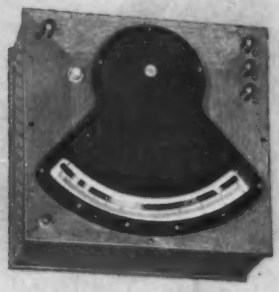
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

*1/10 OF 1%...LABORATORY STANDARDS



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the rugged portables for general test work where long, readable scales and high shielding are desired. Available as D-C Voltmeters, Ammeters, Milliammeters and Volt-Ammeters; and as A-C Voltmeters, Ammeters, Milliammeters, and multi-range Ammeters and Voltmeters; A-C and D-C Single Phase Wattmeters.

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Miniature D-C portables for accurate measurements in shop or field. Available in all required ranges as D-C Voltmeters, Millivoltmeters, Ammeters, Milliammeters, and D-C Volt-Ammeters.

Look at the DIFFERENCE DROP FORGING makes

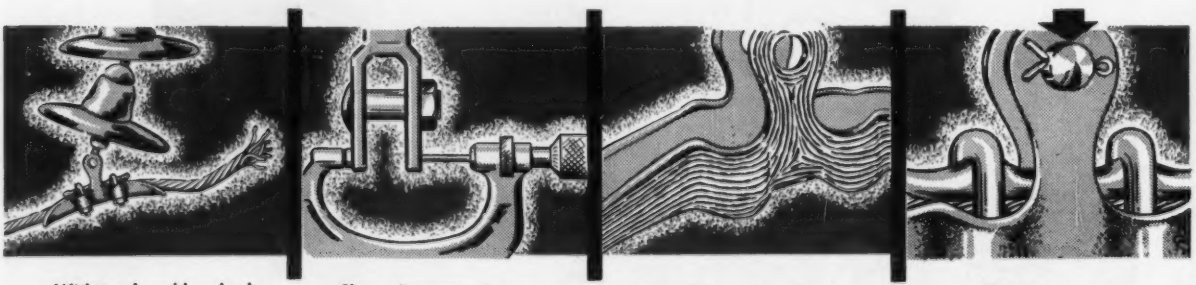
Comparison shows why it pays to specify BTC Drop-Forged Hi-Line Hardware

FORGING WAS FIRST USED by prehistoric man to shape metals to usefulness. Today, it's employed not only to shape metal but to impart strength, lightweight and uniformity of structure as well. The repeated blows of the forging hammer, press or upsetting machine refine the grain structure, toughen the metal.

Brewer-Titchener was first to introduce a standardized line of drop-forged high voltage transmission line hardware. Today, BTC offers a complete line of drop-forged parts and assemblies for your use.

Closed die forging gives BTC Hi-Line Hardware greater strength and soundness, in addition to finer finish and closer dimensional fidelity than can be obtained by other processes. Through forging, BTC Hardware acquires a uniform, fibrous, close-grained structure . . . with the grain flow advantageously following the contour of the part. This results in superior mechanical strength plus the ability to withstand severe loading, sudden shock and frequent reversal of stress as well as to prevent excessive wear on flexibly connected load-bearing surfaces.

Forging permits BTC to design parts and assemblies with lighter sections without sacrificing desired strength. BTC Forged Steel Hardware, for example, may be heat-treated to increase strength up to 50% without adding undesirable mass and weight. All BTC Forged Aluminum Alloy Conductor Clamp Parts are fully heat-treated. The more-than-adequate catalogued strength ratings of BTC Hardware are conservative and are exceeded in actual tests.



Withstands sudden shock

Closer dimensional accuracy

Strength in contour structure

Resists wear on load-bearing surfaces

CAST CLAMP

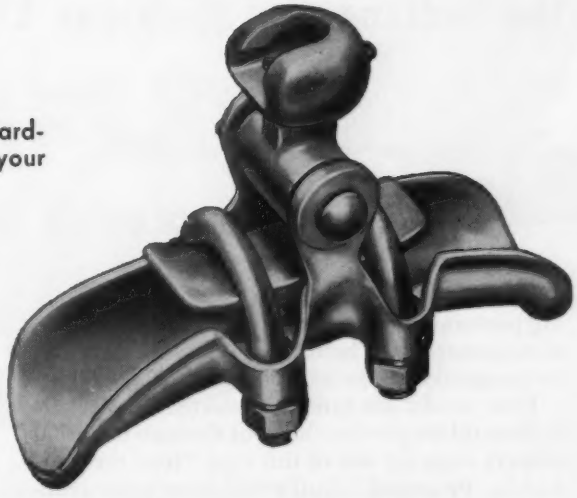
Metal has no fibrous structure. Lower yield and tensile strengths . . . heavier sections necessary in critical areas . . . undesirable extra weight.

BTC FORGED CLAMP

Fibrous grain structure of metal conforms with shape of clamp . . . making clamp stronger, tougher, while permitting lighter-weight design.

NEW BTC CATALOG!

Latest, revised edition of BTC Hi-Line Hardware Catalog now off the press! Write for your **free** copy.



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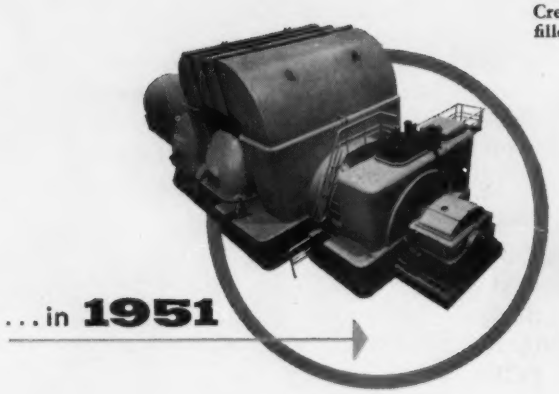
Specify

DROP-FORGED Hi-Line Hardware

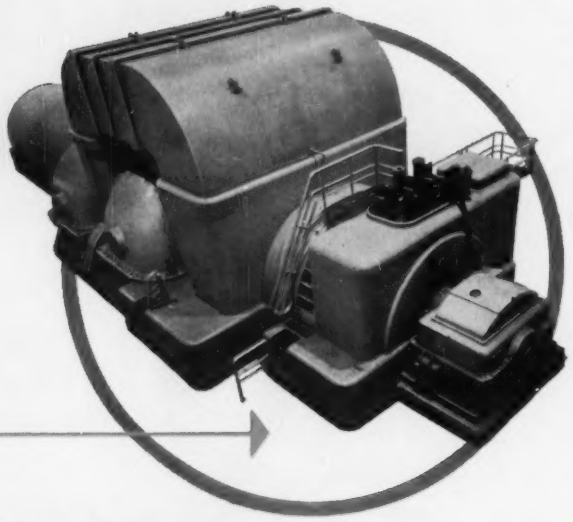
. . From Your Insulator Manufacturer

THE BREWER-TITCHENER CORPORATION, Cortland, N. Y.

Units No. 1 and No. 2 are 150,000 KW General Electric cross compound turbine generators. Unit No. 1 was installed in 1951, and unit No. 2 in 1953, at the Indiana and Michigan Electric Company's Tanners Creek Plant, Lawrenceburg, Indiana. Both lubricating systems were filled with 6500 gallons of Gulfcrest.



...in **1951**



...in **1953**

and again in **1955**

the Indiana and Michigan Electric Company selected

GULFCREST OIL

to provide long range turbine protection

Gulfcrest has an unmatched record of outstanding performance in every make and type of steam turbo-generator. There are two good reasons for its recognition as the world's finest turbine oil.

First, crudes are carefully selected for the best turbine oil properties, then put through the usual refinery steps for oils of this type. Next, the oil is Alchlor Processed—Gulf's exclusive super-refining step which removes the unstable hydrocarbons that form sludge, harmful acids, and accelerate oxidation. Special inhibitors are also added to increase oxidation stability, prevent foam and protect against corrosion.

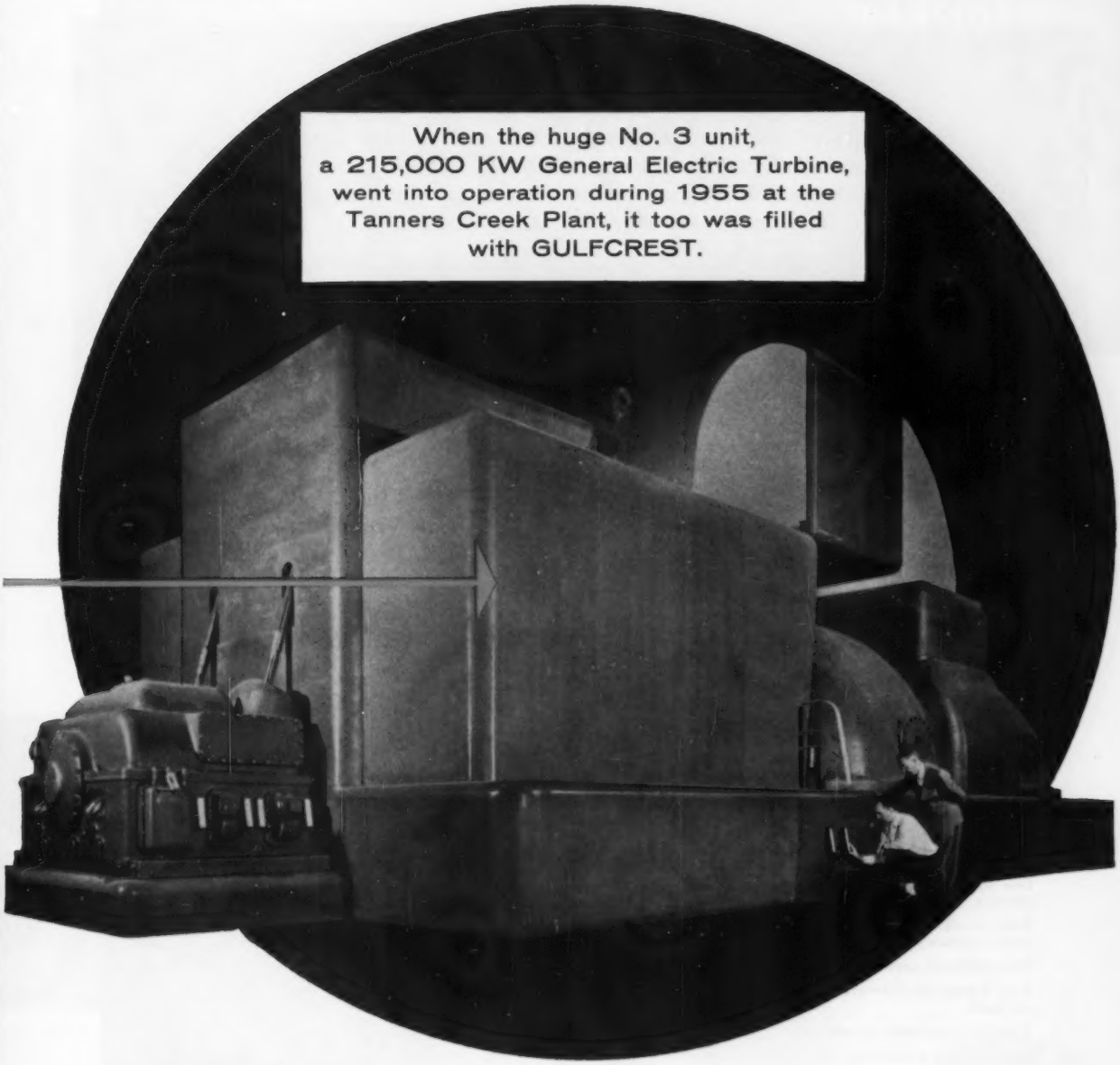
In several large turbines Gulfcrest has been in continuous service for over twenty years. The systems are still free from sludge or rust, and neutralization numbers of the oil remain remarkably low.

The next time you fill a turbine system specify Gulfcrest—and insure safe, long-lasting protection. Consult the telephone directory for the number of your nearest Gulf office and have a Gulf Sales Engineer recommend the right grade of this outstanding oil for your turbines.

Gulf Oil Corporation • Gulf Refining Company

1822 GULF BUILDING, PITTSBURGH 30, PA.

When the huge No. 3 unit,
a 215,000 KW General Electric Turbine,
went into operation during 1955 at the
Tanners Creek Plant, it too was filled
with GULFCREST.



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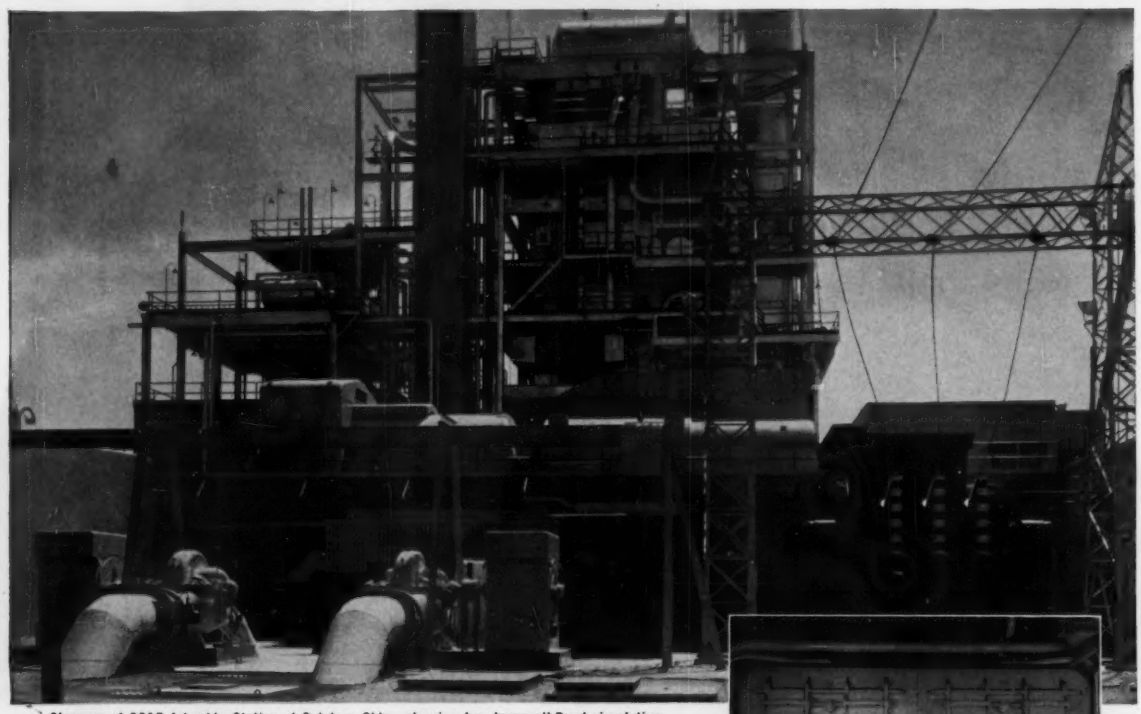
THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

I-R Condenser and Pumps Serve Oklahoma Gas & Electric's

OUTDOOR GENERATING STATION



Close-up of OG&E Arbuckle Station at Sulphur, Okla., showing two Ingersoll-Rand circulating water pumps delivering cooling water to the cooling tower.

PUT into service early in 1953, the 81,500 kw Arbuckle Station of Oklahoma Gas & Electric Co., at Sulphur, Oklahoma, is the first completely outdoor-type station — as well as the largest single generating unit — in the OG&E system. More than two years of successful operation have now demonstrated the soundness of the station design as well as the dependability of all components.

Ingersoll-Rand equipment in service at Arbuckle Station includes the following:

One 60,000 sq. ft. surface condenser with I-R air ejector and priming ejectors.

Two circulating pumps, 30,000 gpm, each driven by 750 hp 450 rpm motor (shown in photo above).

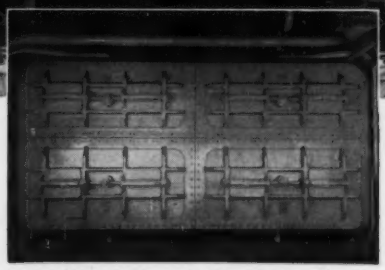
Two 1300 gpm vertical condensate pumps.

Two 5-stage double-case type boiler-feed pumps, 755,000 lb/hr, 1235 psi head.

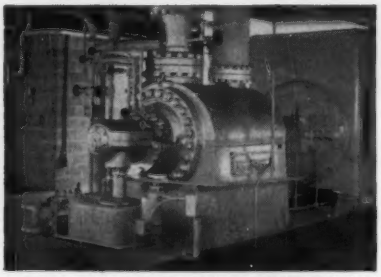
Two 300 gpm make-up pumps.

One I-R fire pump, and one 200 cfm service air compressor.

For power plant equipment of proved dependability and long-range economy, specify Ingersoll-Rand. Your I-R representative will be glad to assist you on any pumping, compression, evacuation or condenser problem.



Ingersoll-Rand two-pass, 60,000 sq. ft. rectangular surface condenser installed beneath the 66,000 kw turbine generator.



One of two I-R 5-stage double-case type boiler-feed pumps, driven by 1750 hp 3600 rpm motor.

Ingersoll-Rand

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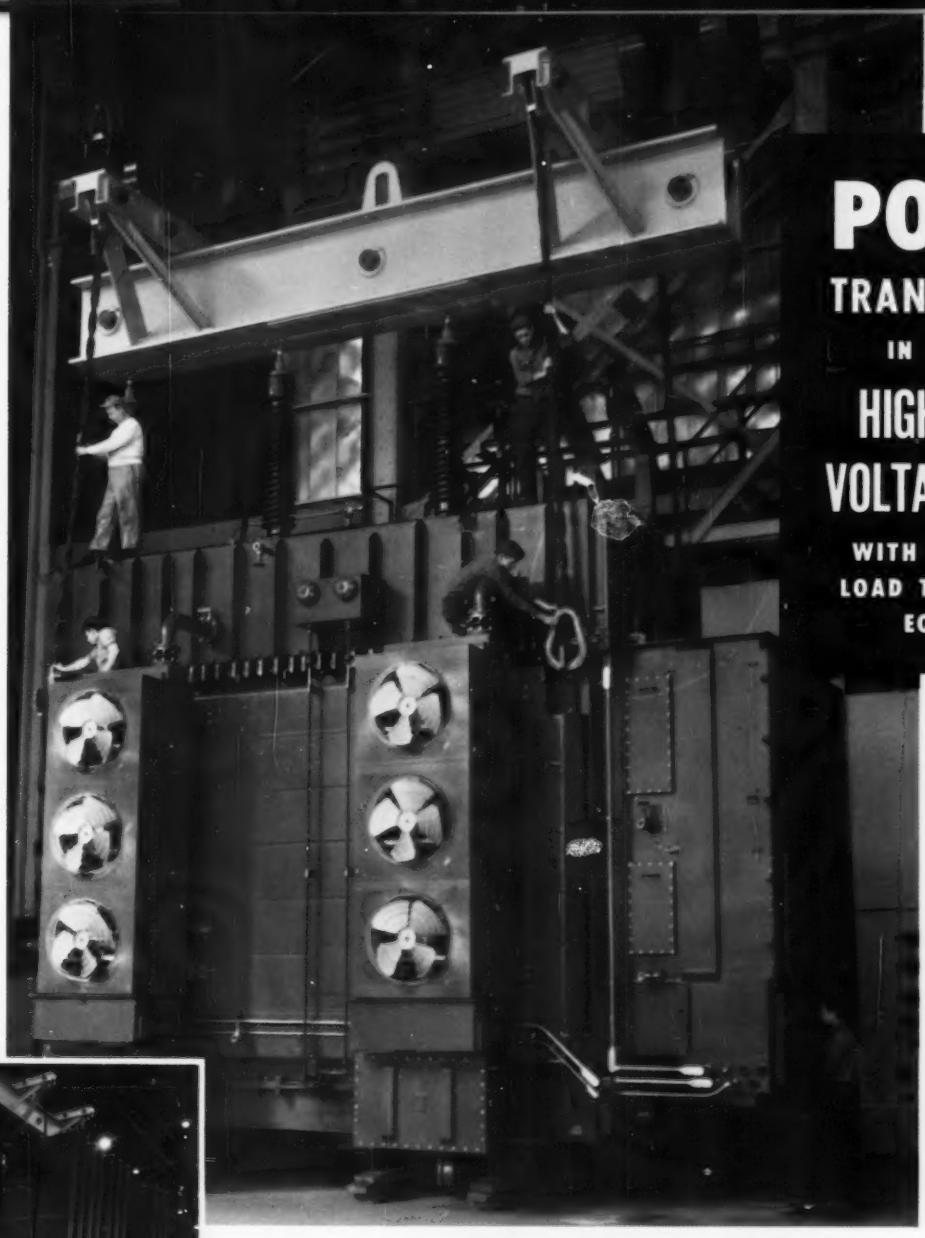

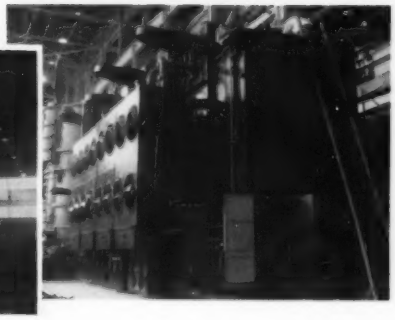

MOLONEY ELECTRIC COMPANY

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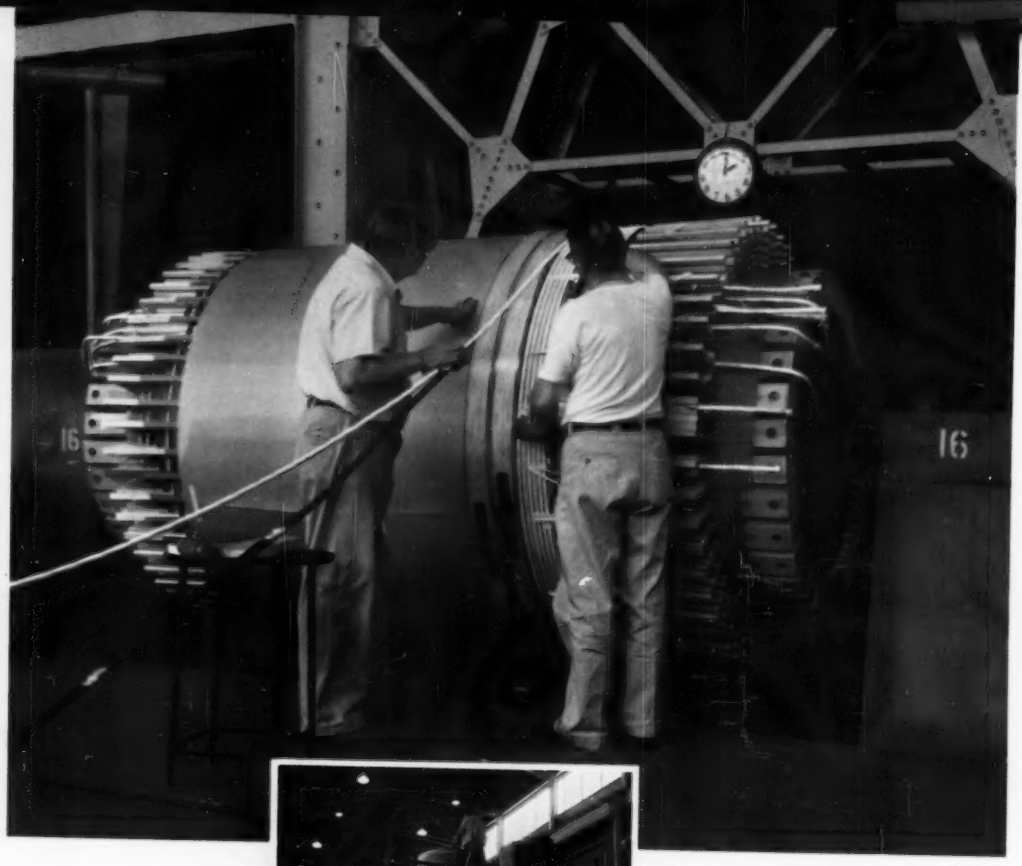
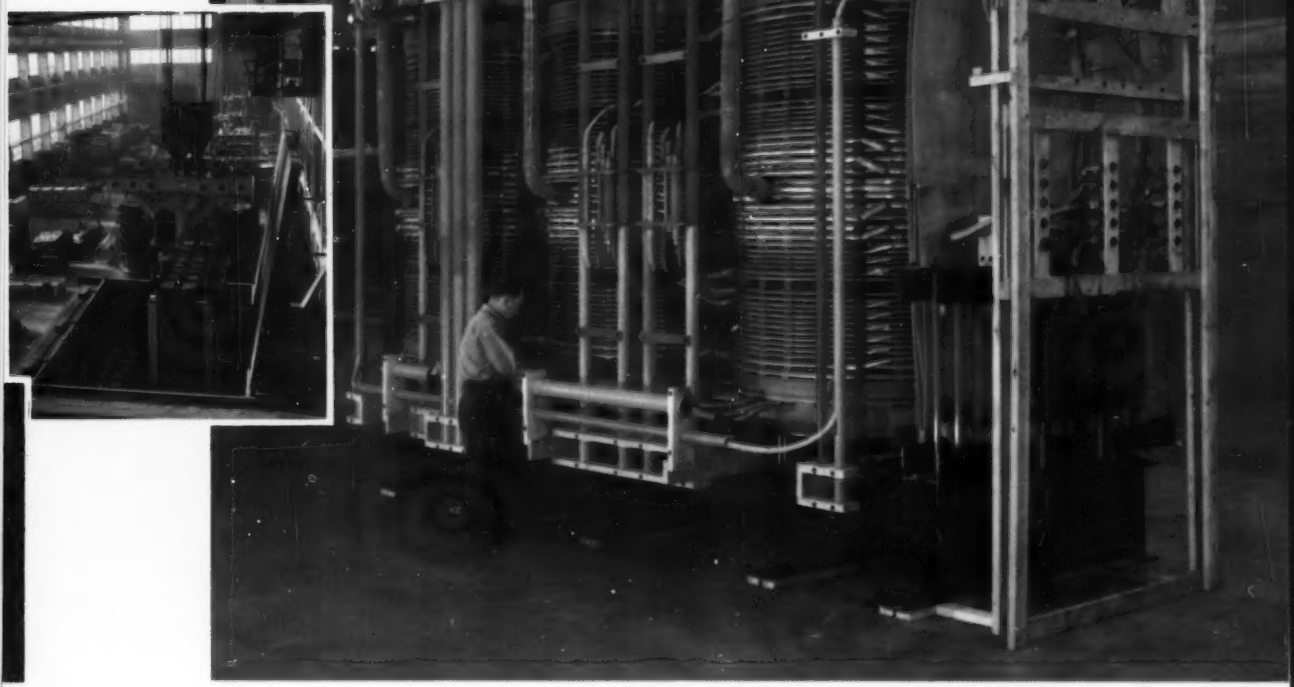
FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA



MOLONEY ELECTRIC COMPANY

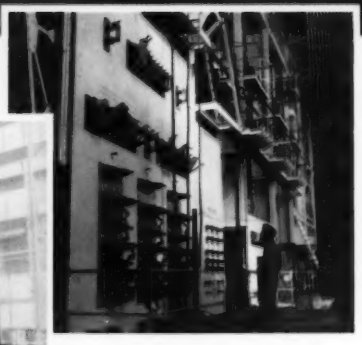
FLEXIBILITY IN DESIGN AND FABRICATION

To best serve your system's needs and to offer dependability in operation and long, trouble-free operating life for an indefinitely long period.



FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

TESTED
DEPENDABILITY
WITH FACILITIES UNSURPASSED ANYWHERE



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FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Developments, Trends To Watch

Average cost per kwhr of electricity to ultimate customers declined 5.6% during 1955 bringing it down to 1.67¢. Largely responsible for this drop is the rapid increase in use by Atomic Energy Commission and the substantial rise in average use by residential customers.

You'll find numerous such developments to be garnered from this, Electrical World's 52nd annual Statistical Issue. The single 56-page section beginning on page 127 furnishes the most dependable basis available for interpreting these developments and spotting the trends that will influence the future of the industry.

Of unusual significance are these:

One third of the growth in industry sales was due to increased use by AEC. This fact plus the substantially lower rates at which the energy was sold to AEC was the major factor in the decline of average cost per kwhr.

Leveling off of AEC use around July of this year will slow increase in industrial sales and brake decline of average kwhr costs to ultimate customers.

Record climb of average residential use—206 kwhr in 1955—brought annual use to 2,755 kwhr per customer. Average rates dropped from 2.69¢ per kwhr to 2.64¢ per kwhr. This, combined with rise in number of residential customers, supports the proposition that residential use will now account for an increasing percentage of over-all industry sales. However, there was a temporary dip in the percentage figure of residential to total sales in 1955 because of the rapid increase in AEC use.

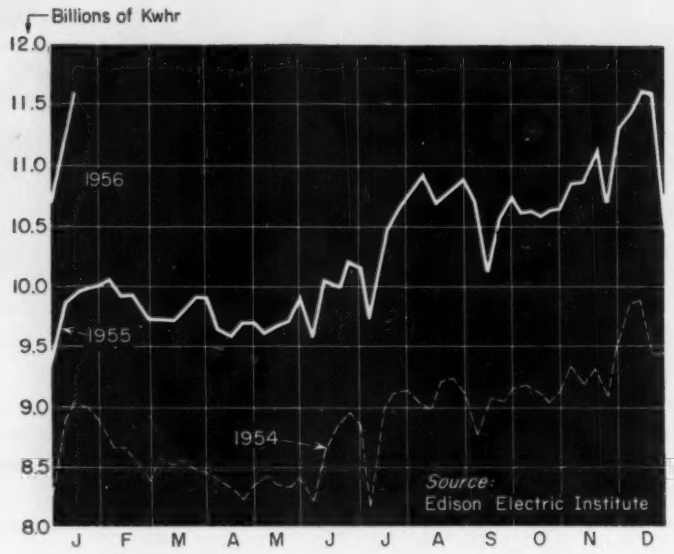
Slight upturn in planned expenditures for generation in 1956 is evidence of the beginning of another expansion cycle after a drop in 1955. Spending in this field will further increase in 1957 and 1958 as utilities reappraise their load growth estimates and prepare for ever expanding requirements.

Sharp rise in capital spending for miscellaneous items in 1956 utility budgets indicates a burst of activity in adding new service and headquarters facilities. Part of the increase will also go for mechanizing utility operations. Spending for these items was deferred because of financial requirements for vast expansion of generating and other plant equipment during the earlier postwar years.

Beginning next year, privately owned utilities will outstrip the publicly owned group in adding generating capacity. Privately owned capacity at the end of this year will represent about 75.4% of total installed capacity. Next year it will edge back to 75.8% and in 1958 will go up again to 76.0%, according to present plans.

Revenues for electric companies were up 9.6% in 1955 over 1954 thus outpacing operating expenses which increased only 6.8%. On a revenue dollar basis, fuel was up 3 mills while salaries and wages, maintenance, and other expenses were off a little over 1¢. Increased coal prices and a larger proportion of fuel generation accounted for the fuel rise. Larger generating units and greater mechanization helped hold down manpower increases. Overall, these savings enabled operating ratio to drop from 45.5% of the revenue dollar in 1954 to 44.4% in 1955.

ELECTRICAL WEEK



OUTPUT

Week Ended Jan. 14
11,594,000,000 Kwhr
Up 16.8%

Atomic Energy Commission requirements — 1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 12.0%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Jan. 14	+16.8	+13.3	+11.2	+25.4	+10.6	+18.8	+12.6	+11.7	+15.9	+9.5
Jan. 7	+12.4	+7.3	+4.9	+18.7	+5.8	+18.2	+8.3	+8.4	+15.8	+4.1
Dec. 31	+14.1	+11.0	+9.8	+21.3	+8.3	+15.3	+10.7	+10.5	+15.2	+6.9

Seasonally Adjusted Index 213.2 Week Ago 213.4 Year Ago 182.2

Issue's Highlights—President's federal power budget asks for $308 million compared with $372 million last year. No provision is made for new TVA steam plants . . . GE arouses gas men with ads proclaiming merits of electric cooking . . . National Electrical Week Committee tells how to make it a grassroots success . . . House Committee prods State Department for action on U. S.-Canadian proposal to develop 2-million kw jointly in Alaska . . . Florida P&L encounters distribution troubles as cold wave drives peak 36,000 kw above capability.

Westinghouse Strike—Back-to-work movement continued its growth at about 100 more each day. Last check showed almost 25% of IUE members at work in nine plants where 19.861 members are employed. Meetings continued daily between Westinghouse Vice Pres Blasier, Union Pres Carey, and Federal Negotiator Murray. Pittsburgh papers last week carried ads from group calling itself Westinghouse Employees Forum soliciting signatures in move to replace IUE officers at East Pittsburgh.

Tennessee Wants Industry—While TVA power shortage last week brought delivery curtailments to many industries and consequently production cuts by these firms, the Tennessee Industrial & Agricultural Development Commission was advertising for more industry. A New York newspaper carried the state-sponsored ad which claimed "industrial power as low as 6.03 mills per kwhr" as one of 14 reasons to locate plants in Tennessee.

Personnel Changes—Columbus & Southern Ohio Electric has elected Harry M. Miller president succeeding late John B. Poston. Miller had been executive vice president. He is also a former chairman of Ohio PUC and former president of NARUC . . . Vernon M. F. Tallman has been elected vice president of Rockland L&P, Concord (N. H.) Electric, Fitchburg Gas & Electric Light, and Exeter & Hampton Electric.

Reactor Plan Postponed—Washington State Power Commission has decided to postpone its original plan to submit proposal to AEC for 30,000-kw LMF nuclear reactor power plant because research is not sufficiently advanced on this type of reactor.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire—Former REA Administrator Claude Wickard announced he will seek Democratic nomination for Senate seat now held by Sen Homer Capehart (D-Ind.) . . . House Interior Committee approved $27-million Ventura Reclamation Project. California legislators have said if measure passes they will block all other water bills, including Upper Colorado River Project . . . Potomac Electric will build new 300,000-kw steam plant in Montgomery County, Md., as alternative to plant in Virginia which would have hampered proposed storage dam on Potomac.

Flood Outlook—Special engineering survey of 1955 floods in Northeastern states prepared for American Insurance Association (116 John St., New York) finds flood threat growing rather than diminishing. Report indicates neither maximum probable loss nor maximum probable frequency of floods in any given period has yet been experienced.

Atomic Energy—Atomic research has uncovered almost as many new problems as it has solved and atomic power presents no immediate threat to coal, Robert E. Wilson, chairman, Standard Oil (Ind., told American Bankers Association last week. Most experts agree, he added, there will be few, if any, "unsubsidized atomic power plants built in this country for purely commercial purposes within ten years." A few may be built between ten and 25 years from now but no existing plant of reasonable efficiency will be shut down.

More Capacity—Hartford Electric Light plans addition of 100-Mw unit to its Middletown station . . . Omaha Public Power District directors have authorized addition of 100-Mw third unit to North Omaha Power station to keep pace with "booming" 61-Mw peak load increase in past two years.

Congratulations—General Public Utilities has celebrated its tenth anniversary. In this period revenue has increased 2.75 times, residential use per customer has more than doubled, and kwhr output of domestic subsidiaries has nearly tripled.

Miscellaneous—New Jersey Gov Meyner has signed bill setting 7½% ceiling on average rate of utility gross receipts taxation. Newly introduced bill would set floor at 5% . . . Cleveland Electric Illuminating has signed 30-year lease for office space in new $17-million building to be known as Illuminating Building.

ABOUT PEOPLE IN THE INDUSTRY

Mayor R. B. Searcy wants his city, Huntsville, Ala., to withdraw from the TVA electric system and build its own power plant because of "high-handed" action of TVA's flood control division in designating Huntsville as subject to extreme floods. Said Searcy: "After dealing with the flood control division of TVA, I am wondering if I am on the right track . . . If one division of TVA can so act, then other divisions can too . . ." Division's attitude, he added, is "'we can do no wrong. This is how it's going to be, and if you don't want it, that's just too bad.'"

About 50,000 miles of U. S. highways are still lighted dangerously below minimum standards recommended by Illuminating Engineering Society after extensive observation and experimentation, according to Dr Samuel G. Hibben, past president of IES. At recent 50th anniversary celebration of society he said "with rate of auto accidents in general continuing to soar, particularly in periods of holiday congestion, we must go on underscoring the importance of better lighting in street and highway safety."

More News About People page 272

Power Construction Expenditures Proposed by Eisenhower

Agency	Fiscal 1956	Fiscal 1957
	(millions of dollars)	
Tennessee Valley Authority		
Multipurpose Projects	2.7	.....
Steam-electric Plants	79.1	32.4
Transmission	21.5	24.1
Army Corps of Engineers		
Multipurpose Projects	189.2	159.6
Partnership Projects	.....	5.0
International Boundry & Water Commission		
Multipurpose Projects	1.9	.....
Department of Interior		
Reclamation Bureau		
Multipurpose Projects	29.2	45.3
Partnership Projects	.....	4.4
Transmission	16.8	12.0
Bonneville Power Administration		
Transmission	27.7	24.4
Southwestern Power Admin.		
Transmission	0.3	1.0
Totals	**368.4**	**308.2**

Ike Cuts Federal Power Budget 17%

- **Partnership development again stressed in recommendations to Congress**
- **No provision made for new TVA steam plants despite future deficit claims**

For the third straight year, President Eisenhower has reduced the federal power budget and the amount of new capacity it will add to the federal system.

In the fiscal 1957 budget he presented to Congress last week, the President asked a total of $308 million for Army Corps of Engineers, Interior Department, and Tennessee Valley Authority power construction in the 12 months beginning July 1, 1956. This compares to $368 million expected to be spent between July 1, 1955 and this coming June 30 (see table). Last year $372.1 million was asked for federal power.

Translated into new capacity, the new budget means the Engineers should add 598,700 kw, the Bureau of Reclamation 90,500 kw, and TVA 230,000 kw—a total of 919,200 kw during the calendar year 1957. This year, their combined totals of additions will run to more than 1,762,000 kw; last year it hit almost 3.5-million kw.

Partnership with local interests is again stressed. Eisenhower promised to submit a later request for $20 million to enable the Engineers and Reclamation to participate in partnership development of John Day Dam, Green Peter-White Bridge, and Bruces Eddy projects. He scheduled 1957 expenditures out of these funds at $5 million for the Engineers and $4.4 million for the Bureau.

Eisenhower also pointed out that partnership construction of Cougar Dam in Oregon and Markham Ferry in Oklahoma is ready to begin during 1957.

Water Resources

The President broadened his partnership theme to include all of the nation's water resources. He called for a greater regional sharing of costs of development of the dwindling supply, based on benefits received.

In so doing, he took advantage of 20 months of study by three of his cabinet officers, the Secretaries of Defense, Interior, and Agriculture. Their cabinet level report on the nation's water resources, submitted to Congress last week, stressed the supply pinch which is rapidly becoming acute in many areas.

In fact, they warned, unless a comprehensive planning program is put into effect, a water scarcity may occur which could become a limiting factor on the growth of some cities, while floods continue to ravage other areas.

Sharing of costs by beneficiaries of water project development is a key point in the new and broader partnership policy.

The cabinet committee recommended that "all interests participate in the cost of water resources development projects in accordance with the measure of their benefits; that the federal government assume the cost of that part of projects where benefits are national and widespread and beneficiaries are not readily identifiable; that power and municipal and industrial water users pay the full cost of development; that where projects are primarily local, and the beneficiaries are clearly identifiable, the federal government's contribution should be limited, with non-federal interests bearing a substantial portion of the construction costs of the project as well as the replacement, maintenance, and operation costs; and that under certain conditions the federal government may bear a higher proportion of the cost."

New Starts Asked

The president asked about $3 million for new starts on federal multipurpose projects. He wants a second 80,000-kw power plant scheduled for completion in 1961 at Fort Peck, Mont., and he earmarked $500,000 for the Corps to begin this $25-million project.

For the Bureau, Eisenhower asked

a total of $2.6 million in first-year appropriations to kick off construction of the 13,000-kw Collbran Project in Colorado, a 4,500-kw power plant for the Colorado-Big Thompson Project, and a 5,400-kw power development in the Weber Basin Project, Utah.

He has also earmarked for later transmission an appropriation of $20 million to initiate action in fiscal 1957 if Congress should pass bills authorizing Upper Colorado, Fryingpan-Arkansas, Ventura, Wapanitia, and Washoe.

TVA Bonds

Eisenhower made no provisions for new steam plant starts in the Tennessee Valley. In fact, he cut TVA steam plant spending from fiscal 1956's $80 million to $32 million for next year.

In its recent annual report, TVA warned that a 500,000-kw power shortage threatens the valley in late 1958 if new plant construction is not begun promptly.

Eisenhower, however, says specifically that addition of one 180,000-kw unit in the John Sevier Plant in 1957, and two 135,000-kw units at Johnsonville in 1958, will meet all anticipated power loads through that year. He asked that a starting supplemental appropriation of $3.5 million, to be applied toward the fiscal 1956 budget, be voted for the Sevier unit. But he asked no funds for Johnsonville, preferring instead that Congress vote approval of the use of proceeds of TVA revenue bonds to finance this and forthcoming expansions.

The revenue bond proposal is the key to the Administration's future program for TVA. It came alive last year when TVA, after three fruitless attempts to obtain funds for new steam plants, submitted a recommendation that it be permitted to issue bonds to finance future construction.

Eisenhower endorsed the principle of the plan, but he altered it to require that bond issues and the construction plans they were to finance would have to be submitted for Budget Bureau approval and Congressional endorsement.

Eisenhower also asked $5.7 million to "clean up" work on five TVA steam plants already in operation. These include the 1.4-million-kw Kingston Plant, Shawnee (1.4-million kw), Colbert (720,000 kw), Gallatin (450,000 kw), and John Sevier.

Transmission

For 1957, the President's program of transmission expenditures is down slightly, at $61.5 million. In fiscal 1956, spending for federal transmission lines will run to an estimated total of $66.3 million.

The money requested now will finance 1,082 miles, bringing the total federal transmission system to 27,200 miles.

Power Marketing

Spending by Interior Department's power marketing agencies will be down slightly. Bonneville Power Administration will have an estimated $24 million, or $4 million less than in 1956 for transmission. Southwestern Power Administration's operation and maintenance spending will run about $1 million, compared with the $1.25 million voted last year. But the Administration wants to raise SPA's continuing fund for purchase of power by $400,000, to $6.4 million. No new construction is proposed for SPA or for Southeastern Power Administration, the 1957 request for which will run to $1.4 million.

Regulation & Investigation

The Federal Power Commission's small administrative budget is up $600,000 to $5.25 million for fiscal 1957. Part of this will go toward boosting the number of studies of river development projects from 105 in 1956 to about 110 in 1957.

Other agencies have funds programmed for investigations of projects. TVA has $334,000 earmarked for this purpose. The Corps of Engineers has $5.4 million programmed, but much of this will be spent on advanced engineering and design of navigation, beach erosion, and flood control projects. The Corps also has endorsement for its second request for $1 million to study the possibility of harnessing the tidal currents of Passamaquoddy Bay in Maine.

The Bureau of Reclamation has a total of $5.7 million scheduled for water project studies. The Geological Survey has $8.5 million listed for water resource investigations.

Rural Electrification

Next year's budget calls for $170 million in new borrowing authority for the Rural Electrification Administration, a cut of about $90 million from this year. REA is armed with a carryover fund which it can tap, and it now has the authority to expend its loan moneys where needed, rather than adhering to the old state-allotment formula which prohibited more than a given percentage of total funds from going to one state.

Eisenhower estimates REA loan activity at $185 million.

Atomic Energy

The operating budget for the Atomic Energy Commission will rise to $1.7 billion from a 1956 level of about $1.5 billion. The increase is reflected in stepped-up programs — buying of special nuclear materials, weapons and reactor development, research.

The 1957 estimate for the Civilian Power Reactor Program is $38 million, compared with $36.7 million for 1956.

Senate Committee Okays Niagara as State Project

The Senate Public Works Committee kicked off action on Niagara power last week, voting 6-2 to report the bill, introduced by Sen Herbert H. Lehman (D-N.Y.), to authorize New York State Power Authority to develop additional power on the river. The group rejected the bill, introduced by Sen Homer E. Capehart (R-Ind.), to authorize private development.

This early action puts the House on the spot since it had passed two years ago the Dondero proposal for private development. No plans have yet been seen for House action this year.

Sen Dennis Chavez (D.-N.M.), chairman of the Senate committee, said he expects the Senate to take up the Lehman bill shortly.

Index on the Way

Electrical World's semi-annual index for July-December 1955 will be included with one of the February issues rather than a January issue as previously stated.

Gas Men Don't Like This Ad

Here's blow-by-blow report on electric range ad scheduled to begin appearing in consumer magazines next month. It's got the gas people up in arms

There's an electric range advertisement slated to appear in a national consumer magazine next month which already has stirred up more cries and anguish in the industry than anything that has come along in some time.

"Now . . . Cooks Faster than Gas," headlines the ad. Signed by General Electric Co, it goes on to say its ranges have a speed cooking unit that is "faster than the fastest gas burner tested." Explains a footnote:

"The 2,600-w GE unit was tested in GE laboratories against the large burner on each of four leading gas stoves. Tested in accordance with American Standard Association electric range tests, the GE unit brought two quarts of water to a boil over 20% faster. Also one quart and two cups of water were tested; the GE unit was faster every time. Gas burners were tested under identical conditions with burner input of 12,000 btu per hr (large burner requirement under Gas Appliance Manufacturers Association certification standards.)"

The ad has yet to appear. But other ads on this theme were run last month in newspapers in northeastern Ohio, considered one of the toughest gas competitive areas in the nation.

To say the reaction they brought from the gas industry was explosive is putting it mild. Here's what happened:

• Cries of unethical advertising arose everywhere. "This kind of advertising can ruin our business," grumbled one gas man.

• American Gas Association Pres Dean H. Mitchell immediately wired all members urging telegrams of protest be sent to GE Pres Ralph Cordiner. Said Mitchell, who is president of Northern Indiana Public Service Co: ". . . The advertisements (are) jeopardizing your gas investments and threatening the acceptance of gas for cooking." Going further, he said the statement that electricity cooks 20% faster is based on findings that are "technically special" as indicated by AGA laboratory tests and "are not acceptable to normal domestic cooking, thereby misleading the public in making its choice."

Call Ad "Unethical"

At a meeting later on in Cleveland, the gas people got together with GE to discuss the matter. They did not dispute the test figures. But they still insisted the advertising was "unethical" and asked GE to refrain from using the theme and test results in future advertising. Their objections:

1. The advertising infers that all elements of the range are faster. GE says the claim will be made only in respect to the 2,600-w unit.

2. The test conditions used were of a "special" nature and do not represent normal cooking conditions. GE maintains the unit is faster under both test and normal cooking conditions and the claims are not based on any special conditions at all.

The meeting apparently did not bring results satisfactory to the gas people. GE still plans to carry through with the theme, and there were indications that AGA would take its case to the Federal Trade Commission. GE was quick to point out that it is the same story that has been used to sell gas cooking for years. "But now," said one company spokesman, "we're beating them at their own game."

The episode quickly became a "cause celebre."

Said J. W. McAfee, president of Union Electric Co of Missouri (which also runs a small gas operation in part of its area): "The two services should stand on their own bottoms. If one is superior, then the public should be told so."

Said E. O. George, Detroit Edison Co's manager of sales: "It should serve to step up competition and anything that does that is good for the whole industry."

Last Ditch Fight

GE itself sees all this as a last ditch stand in the battle of the fuels."Gas cooking is on the downgrade and the gas people know it," said a GE executive. "If the gas industry plans to go to higher burner inputs (there was talk they may raise input from the present 12,000 to 18,000 btu) they will suffer rapidly declining efficiencies. And no matter what the gas industry does they will never be able to compete in speed with the new electronic ranges coming on the market."

National Electrical Week

Aims, Local Planning of Event Outlined

Objectives of National Electrical Week, set to begin Feb. 5, and a plan that can be followed to make the event a public success were outlined recently by National Electrical Week Committee Chairman Merrill E. Skinner, vice president of Union Electric Co of Missouri (EW, Dec. 26, p 56).

This year, Skinner stated, the week will be observed largely on the local level with programs sparked by utility companies, electrical manufacturers, inspectors leagues, dealers, distributors, and contractors.

Present plans call for expanded activities on a national level in 1957 with details being worked out by the NEW committee.

Objectives of the week's observance this year were outlined by Skinner as follows:

1—To focus attention on the contributions of electricity to our way of life and on the contributions toward the economic strength of our country by the organizations which make up the electrical industry.

2—To emphasize the contribution to safety that can be accomplished through electrical wiring installations.

3—To encourage recognition of electrical pioneers by selecting for this event the week in which falls the birthday of Thomas A. Edison.

Set for emphasis in the week-long observance is the problem of inadequate wiring. The electrical week committee, composed of major segments of the electrical industry, recently stated, "The inadequately wired home and building is today the bottleneck that . . . threatens the entire future of the electrical industry. The situation is far more serious than appears on the surface . . . defective wiring heads the list of fire causes.

"Electrical appliance manufacturers . . . are in a tough spot. Electric utility companies also need help in order to dispose of their product—electricity. (This help) must come through educational efforts. . . ."

The committee's outline of what can be done on the local level to make National Electrical Week a success and to take advantage of the inherent educational possibilities appears below.

The NEW Committee is currently working on a guide book to be available for use in 1957 and future years. It will suggest additional ways for participation in the annual event.

CORRECTION:

Vermont Peak Rise

In listing peak loads of various utilities on page 54 of the Jan. 9 issue Electrical World incorrectly reported an increase of 1,100 kw or 1.25% in the 1955 winter peak of Central Vermont Public Service Co. The actual increase over the 1954 winter peak was 11,100 or 12.6%.

How to Make NEW a Success

National Electrical Week Committee recently presented a plan of action to organize and promote the week-long observance and its objectives. The suggested program is outlined below.

Kick-Off with a Meeting

Call a meeting of representatives of business, civic, and governmental organizations in your community. Include the Mayor, school superintendent, fire chief, commercial and service clubs, veterans organizations, churches, newspapers and radio and television stations, parent-teacher associations, appliance dealers, electrical contractors and distributors, electric utilities, and women's clubs.

Select Chairman, Sponsor

A successful man and outstanding civic leader should be selected as chairman. And local sponsorship should be handled by the electric utility in the area, a commercial club, the chamber of commerce, or any of the leading service clubs.

Appoint Committees

To carry the ball for various phases of the program, committees should be appointed. Suggested committees and their purposes follow:

Finance—to handle the money necessary for printing educational and promotional material.

Publicity—to encourage merchants, dealers, and electrical contractors to point up objectives of the week in their advertising.

Posters and Essays—to handle contests in schools and youth organizations where inexpensive prizes may be awarded for best posters and essays. Art work so acquired may be displayed in show windows.

Speakers—the committee would provide speakers, selected from men in the electrical field, for club and other assemblies in the community.

Window Displays—to assist merchants in setting up displays to advertise the purposes of the week.

Home Inspection Reports—to distribute these reports which have been found an effective way to stress the need for electrical safety and adequate wiring when passed out to school children. A check list for proper wiring in the home comprises most of the report.

Radio Stations—to arrange spot radio announcements and appropriate interviews over local radio stations.

Newspaper Advertising—to coordinate merchants' advertising and electrical week publicity.

Proclamation—to urge the Mayor to issue a statement or proclamation supporting the week.

Adequate Wiring—to push this phase of the program mostly in contact with other committees.

Farm Districts—to promote electrical week in farming communities.

Clean-up and Fix-up Week—to promote a joint effort with those in charge of this observance.

Electrical Inspectors and Fire Department—to work out program with these municipal workers pointing up electrical week activities and objectives.

Florida Loads Hit New Peaks

. . . as unique cold wave sweeps winter sun-land; Florida P&L has distribution troubles with peak 36 Mw above capability

Florida utilities experienced record peak loads and some distribution troubles when residents and vacationers turned on the heat—in many cases electric heaters—to combat a unique cold wave which hit recently at the height of the tourist season.

Of the three major companies servicing the state, Florida Power & Light Co had the most trouble, followed by Tampa Electric Co.

The cold snap was attributed to a hurricane-like disturbance that remained off the Atlantic coast for several days. The temperature in parts of Florida dropped to below freezing and in Palm Beach equalled the 27F record set in 1940.

Florida P&L had a peak of 926 Mw —36 Mw greater than generating capability. The deficit was made up through interconnections but would have been greater if some interruptible load had not been dumped. The peak also would have been higher had all transformers continued working.

But many distribution transformer fuses blew and some transformers burned out. Crews worked around the clock for several days restoring service.

Florida P&L's tremendous peak can be traced in part to a federal government official's recommendation several years ago that homes south of Ft. Pierce did not need heating facilities. During the big housing boom after World War II his advice was followed. Although the recommendation was withdrawn two or three years ago, a 1950 survey revealed that only 33% of the homes in that area had provisions for heating.

Florida P&L is presently constructing 410-Mw of new generation to meet normal growth. The company reported a peak 50% greater than that experienced in normal weather.

Tampa Electric's load hit a 309-Mw high—1 Mw less than capacity. Some small distribution trouble resulted but affected service was restored within an hour.

Stevenson Wins Kwhr Pool

Winner of the 1955 Kwhr Power Generation Pool is J. R. Stevenson, recently retired director of the Electric Division, Memphis Light, Gas, & Water Division. His estimate of 542,995,-000,000-kwhr output for the nation in 1955 was about 0.7% below Federal Power Commission's figure of 546,-837,824,000 kwhr. There were 385 contestants.

Stevenson is fourth of ten pool winners who retired shortly after winning the contest, said Robert M. Hatfield, Jr, contest director and vice president of Combustion Engineering, Inc.

Hatfield's tongue-in-cheek comment after totaling up the statistics: "I did not realize winning the pool provided sufficient security to encourage retirement."

Coming in close behind Stevenson in the latest contest was Allan Williford, president of Link Aviation, Inc, who placed second with an estimate of 541,795,000,000 kwhr. Third place went to Harry Pritchard, president, Indianapolis Power & Light Co. Not far behind was fourth place winner B. W. Webster, executive vice president of New England Electric System.

Other winning participants were W. W. Godard, Cleveland Electric Illuminating Co, fifth; S. M. Von Klonowski, Ebasco Services, Inc, sixth; Walker Cisler, president, Detroit Edison Co, seventh; and Ed Morehouse, vice president, General Public Utilities Corp, eighth.

Each of the eight men will be presented with a diploma and an honorary degree conferring the title of "Master in the Art of Load Forecasting."

"The extreme optimists were the only ones who finished in the winners group," Hatfield commented. The top eight came within 2% of FPC's figure which represented a load growth of about 15.7%. But the growth predicted by an average of pool entries was only 8.4%.

In pointing out past winners who had retired after pocketing their jackpot, Hatfield listed George Merritt, Westinghouse Electric Corp, 1946 winner; Sam Bowler, Long Island Lighting Co, 1948 winner; and I. C. Steele, Pacific Gas & Electric Co, 1951 winner.

Reynolds, Ford Sign Hot-Pour Operation Pact

As part of plans for a hot-pour operation, Reynolds Metals Co recently agreed to supply a nearby Ford Motor Co plant with more than 640-million pounds of aluminum during the next ten years.

The Reynolds-Ford contract, renewable at Ford's option, provides that Reynolds will deliver most of the aluminum in molten form direct from its aluminum-producing plant to be built at Listerhill, Ala., to the Ford foundry to be built adjacent to it.

Tennessee Valley Authority, after reportedly submitting the most favorable power bid, has signed a 10-year contract to supply up to 225,000 kw per year to the new plant.

George O. Wessenauer, TVA's manager of power, told EW specific plans for supplying the power had not been made. However, he added that the Reynold's plant, to be located near TVA's Colbert Steam Plant, would probably be served by tapping 154-kv transmission system. And if necessary, transmission lines would be built from Colbert, he said.

Ford will use less than one-third of the 200-million pound annual output at the new aluminum plant.

House Unit Urges Alaska Hydro Plan

- **More than 2-million kw estimated as Yukon headwaters potential power**
- **Canada-U. S. cooperation believed must for full benefit; but Canada balks**
- **State Department prodded to urge Canadian consideration of joint effort**

Power potential of the Yukon River's headwaters in southeast Alaska and British Columbia has been estimated at more than 2-million kw, but largely because of a halt in talks between the U. S. and Canada, no one so far has developed it. Last week a Congressional committee was organizing a push to at least get a joint development program in the discussion stage.

The House Interior Committee, with a strongly worded letter, kicked off its plan to prod the State Department into pressuring Canada for resumption of abandoned talks aimed at such a program to harness the headwaters' power.

Canada Won't Talk

After a joint study of the area was completed in 1951, Canada refused to talk further with the U. S. about joint development. Instead, she decided to strike out on her own despite a widely held belief that the greatest power potential in the area could be realized only if the two countries worked together.

If the House committee succeeds in bringing the U. S. and Canada together again, the project could take on the aspects of a foreign policy goal, with Presidential backing.

In the panhandle section of Alaska, interest has been growing for some years in a U. S. project to divert the headwaters and harness them for electric power production. And since the project's inception, power estimates have also been growing.

Latest Power Estimates Up

In 1951 the then U. S. Reclamation Bureau, district manager figured eventual installed capacity could reach 900,000 kw; this year his successor estimated the project would be worth at least 2.2-million kw.

A few years ago, too, the Aluminum Co of America showed distinct signs of interest. In fact, when Alcoa announced without warning that it planned to go in and look over the possibilities of hooking up the river to a proposed aluminum reduction facility, the Canadians promptly took steps to beat Alcoa to the punch.

Alcoa's mill, of course, would have been placed on American soil, contributing nothing to Canada's coffers. The Canadians set out to examine their own terrain in the hope that a similar proposal could be worked out within their own borders. It licensed Frobisher-Ventures to make preliminary studies.

The result of this conflict has been an apparent complete withdrawal of Alcoa's interest and a growing possessiveness and secretiveness on the part of Canada which has created a cold war atmosphere in this semi-Arctic zone.

If the interior committee is successful in persuading the State Department to have another go at negotiations with the Canadians, there's some hope that a trade could be worked out.

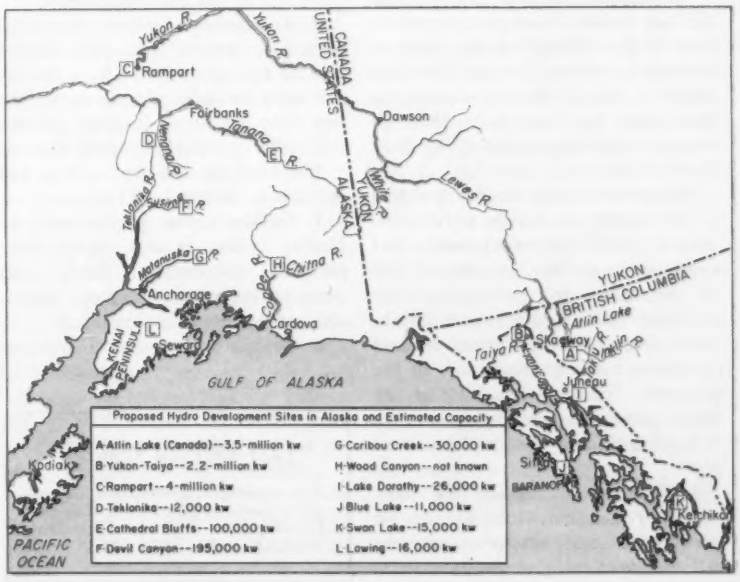
The Canadians have no opening to the sea north of Port Edward, about 300 miles south of Juneau, Alaska. But if they joined this country in promoting aluminum plant location at an Alaskan terminus for power generated through a joint development, the U. S. could provide the modern seaport essential to shipment of basic aluminum reduction raw materials.

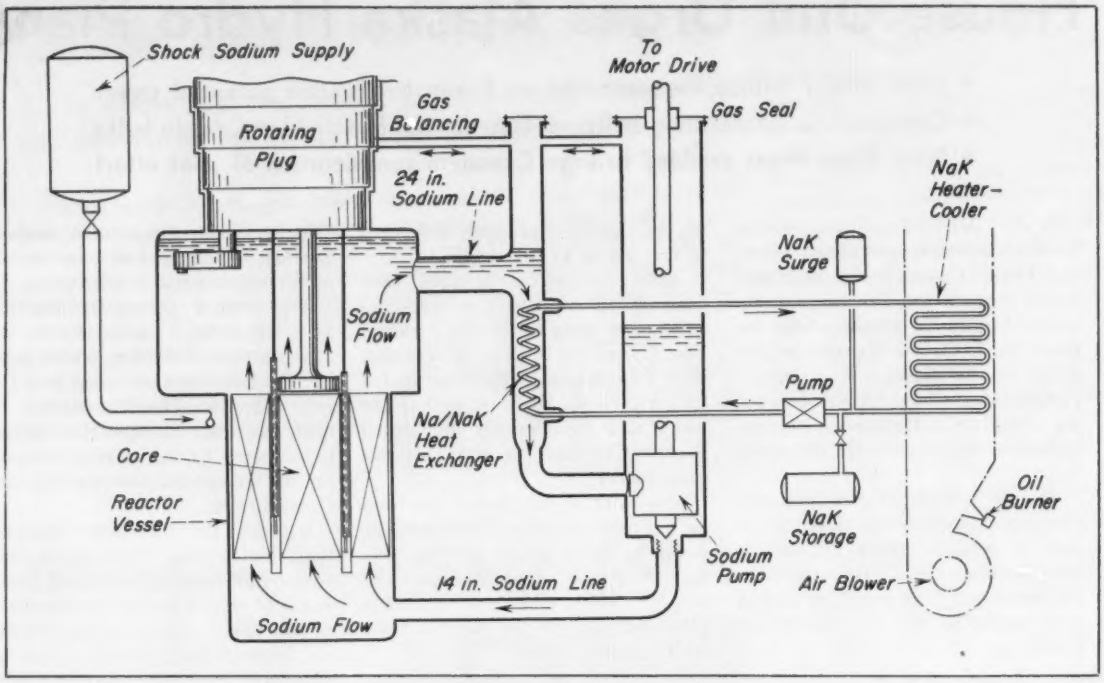
The Interior Committee and the State Department have already exchanged communications on the matter. The committee has asked State for information on what Canada has already done, but the diplomatic agency is hampered by the security imposed by the companies investigating the Canadian site.

Recently the Canadian Financial Post hinted that Washington was bringing pressure to bear to bog down studies of an all-Canadian development on the Yukon. The Canadian project has involved an elaborate system of tunnel-dam diversions to create a huge reservoir out of Atlin Lake in British Columbia to feed a 3.5-million-kw powerhouse near the lake's south end (see map).

Late reports indicate that Ventures is also investigating a smaller development on the Nass River southeast of the Alaskan panhandle border. This may or may not represent a shift in Canadian plans.

(*Continued on page* 296)





By using full scale test facilities APDA will . . .

Test Reactor Before Installation

GENERATION
Design

Atomic Power Development Associates will test reactor parts, steam generator, and NaK-water and sodium-air reactions for breeder reactor to be built by Power Reactor Development Co

To insure successful operation of the fast breeder reactor that will be used in the 100-Mw power plant to be built by Power Reactor Development Co, Atomic Power Development Associates, Inc, has undertaken an extensive testing program (EW, Nov. 21, 1955, p 8).

The program calls for: (a) Building a test facility in which a full-scale reactor vessel, superstructure, and many of the related components will be installed, (b) determining the probable NaK (sodium potassium)-water and sodium-air reactions, and (c) testing a seven-tube section of the proposed "once-through" boiler or steam generator.

Test set-up has two primary purposes:

1. To test and evaluate the components which may subsequently be used in the actual reactor installation and the functioning of the mechanics of design of the proposed reactor.

2. To provide a facility where those who will operate the actual reactor can be trained and will have an opportunity to gain experience in the operation of liquid sodium systems and other novel and unique devices.

It is expected that the mock-up will be used to test and evaluate:

1. Sodium system performance including system pressure drops, temperature distribution, filling and draining procedures, sodium inertia, and sodium impurity control.

2. Reactor control system performance including scram time and resulting vessel stresses.

3. Mechanical handling system performance including the effect of distortion on indexing.

4. Shock-temperature effects on reactor vessel and associated components.

5. Over-all coordinated functioning of the mechanical handling system, control system, and other reactor components.

The installation will be used to make miscellaneous tests which appear desirable from time to time.

It is hoped that test facilities will be complete by late 1956 or early 1957. Plans call for a year of experimenting with this equipment to see how it operates. The decision will then be made as to whether to use the parts of the mock-up reactor in the actual reactor installation, to modify them, or to build a new and different reactor.

FAST BREEDER REACTOR

For complete description of reactor proposed by Power Reactor Development Co see Electrical World Nov. 21, 1955 p25.

The tests planned will be rugged. Thermal shocks and transients may damage the equipment.

The only things that it will not be possible to test will be nuclear operation and neutron damage to materials. Fuel elements will be dummies. However, tests for neutron damage to fuel materials will be conducted elsewhere.

Control system will be mocked up. However, this test will determine only mechanical operation, not nuclear operation which will be done elsewhere. In separate test equipment the speed of control rods will be checked to determine how fast they accelerate and to determine the channel diameters and clearances required.

Training Will be Possible

Training reactor operators will be a most important part of any reactor project. The test set-up will make it possible for operators to become thoroughly familiar with the reactor and the functional conception of its operation. Subsequently, operators likely will be assigned to plants where reactors are in operation to gain experience in handling "hot" equipment.

Chief differences between the full-scale reactor test facility and the subsequent power reactor installation will be:

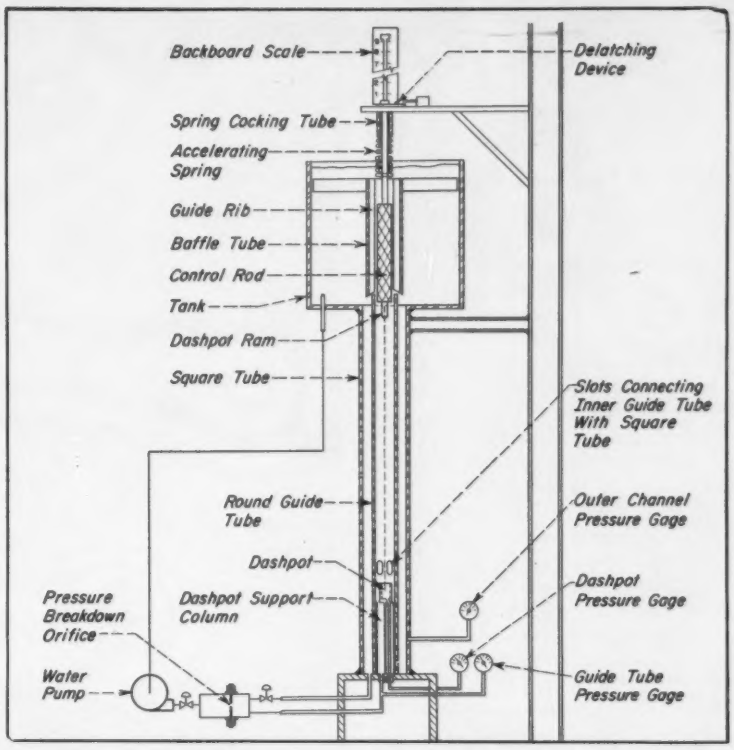
1. Test facility will not be made radioactive at any time.

2. There will be no gas-tight reactor building surrounding test installation.

3. Reactor plant installation will have three primary liquid metal coolant loops. Test facility will have only one primary loop. Places for the other two will be closed off at their points of connection to reactor.

Essential Parts Included

Basically, the mock-up reactor of the test facility will comprise all essential parts of the proposed reactor: The reactor pressure vessel and associated equipment, a top plug known as the rotating shield plug, fuel element handling equipment, control equipment, simulated fuel and blanket elements, and one sodium loop. Because only one of the three sodium loops of the reactor plant will be used in the test set-up, the reactor vessel will have two-thirds of its internal volume and flow area blanked-off with dummy fillers. The active third will contain simulated fuel elements, control rods, and blanket elements.



HYDRAULIC CONTROL ROD drop test will check speed of rods, determine how fast they will drop with the dash removed, and diameters and clearances required

Rotating shield plug is installed over reactor vessel. Several control rod actuators and the remotely operated fuel elements handling device are mounted on this plug. This equipment penetrates the plug to enter the reactor compartment.

Single sodium loop will be equipped with an 11,800-gpm prototype pump, appropriate valves, surge tank, sodium storage and gas sealing systems. A small heat exchanger, in place of the intermediate heat exchanger that will be used in the actual plant, will function only as a temperature controller for isothermal test and will, therefore, be only a small coil transferring heat between the sodium and the NaK loop.

The reactor vessel, rotating shield plug, fuel element handling mechanism, sodium pump, and control drive have already been ordered. Bids have been received for primary system piping, and orders for these parts should be placed soon. Purchase of other equipment is also progressing.

Essentially, the test facility will be operated as an isothermal test loop, deriving the major part of its heat input from pump energy. The NaK control loop will be capable of removing excess heat to maintain temperature at 450 to 1,000F. It will add heat to the sodium loop during start-up and low flow rate operation because at those times the pumping energy would be insufficient to heat sodium to the desired temperature.

Reactor vessel and associated components will be tested under conditions of transient temperature changes anticipated for the reactor plant. Either the sodium surge tank or an auxiliary shock supply tank will be used to introduce the desired shock temperature into the reactor vessel for about a 30-second duration.

For fire protection for this relatively large sodium system, a containment tank and piping will be installed outside the insulation of the main reactor vessel and the sodium piping. Under normal operation, inert gas will be contained in the resulting annulus. In the event of a sodium leak and fire, the inert gas will snuff out the fire.

Because both sodium and NaK used in the coolant loops, burn in air and react with water, tests are being made to determine the possible causes

of accidents. It is particularly important to know the probable results of a tube failure in the boiler which might permit the leakage of boiler water into the secondary (NaK) coolant systems.

Isolated Test Area Used

Tests to determine such reaction effects are already under way. Because any accidents in these kinds of tests might be serious in a closed building or to people in nearby areas, a large-scale NaK-water reaction test is being performed in an isolated quarry near Detroit. A laboratory-scale sodium-air test is being conducted in a research laboratory.

The object of the boiler equipment tests will be to determine the feasibility of using a once-through boiler in a fast breeder nuclear power plant in which liquid metals are used as the heat transfer medium. Start-up and shut-down operating procedures will be checked. With these tests normal and transient operating characteristics of this type of boiler as applied to a nuclear power plant system will be investigated. About 170 thermocouples will be provided to obtain the desired information on the boiler.

Water Purity to be Studied

Effects of feedwater purity from the standpoint of scale deposition in the transition zone and associated problems in removing deposits will be studied. Tests will be used to study the water and steam side circuit stability.

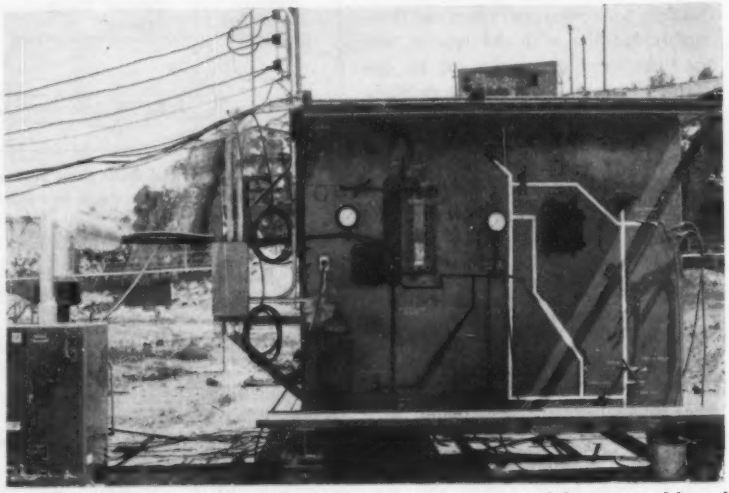
They will also be used to determine the effects of thermal cycling and shocks on materials due to thermal cycling. Some heat transfer data will be obtained for the purpose of analyzing heat transfer film coefficients where feasible.

Because these tests involve the use of NaK and water at high pressure separated only by a single thin-wall tube, they will be performed at the quarry site now being used for the NaK water tests. An oil-fired NaK heater will be used as the heat source for the boiler equipment tests.

The test reactor and its components will be erected in a former power plant building. A 7,500 lb hoist will be used for handling the control rods during installation and dismantling.

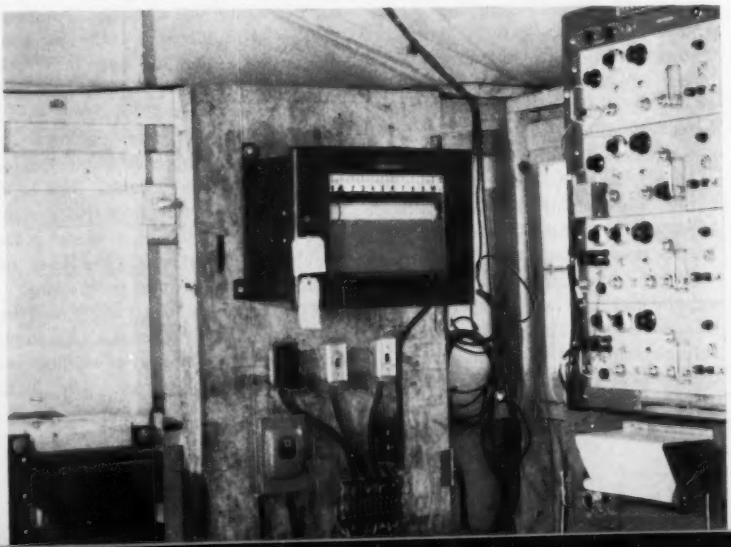
By using this test facility it is felt that many problems can be resolved before the reactor is actually installed and operated.

NaK-WATER TEST FACILITIES were set up in quarry to gather information on this reaction. Operating shanty is at left with test stand and waste pit at the right



CLOSE-UP VIEW of test stand shows water loop diagram on left section of board (black) and NaK loop diagram on right (white). Gas-fired boiler is at the left

OPERATING SHANTY at the test grounds contains voltage regulator, the control circuits, high speed temperature recorders, and pressure measuring instruments



APPLIANCE BOOM: No End in Sight

1955 set record $7.9 billion volume. This year's outlook is for still further increases

The appliance-TV industry has done it again.

Sales of $7.9 billion (retail value) in 1955 broke all previous records, including the $7.4 billion mark set in the Korean War scare of 1950, according to the annual statistical issue of Electrical Merchandising, a McGraw-Hill publication.

All Divisions Showed Gains

It was, according to the magazine, a year marked by substantial gains in all three divisions of the industry. Major appliance sales contributed $4,829,104,700 to the total, a big jump from 1954's $4,090,819,800. Television, which everybody expected —for about the third year in a row —to suffer from the imminence of color, marked up the biggest unit sales in history and combined with a reviving radio industry to pass the $2-billion mark. Electric housewares, aided by the mushroom growth of new devices, finally exceeded $1-billion.

Although national prosperity, high-consumer incomes, and public confidence were responsible for much of the increase, the industry also got a bigger share of consumer disposable income than ever before—2.9% as compared with 2.67% in 1954. What's more, says Electrical Merchandising, the proportion is likely to go up again in 1956, already heralded as another boom year in the making.

Older Appliances Sold Well

In contrast to 1954, when unit sales increases were often confined to the newer appliances, sales in 1955 were up in almost every category. Some of the older, high-saturation items like refrigerators and ranges and water heaters made strong recoveries.

Take refrigerators, for example. In 1954 they'd slipped off a little to 3,600,000 units, but in 1955 they jumped to 4,025,000—the best year since 1951—and did it despite the fact that 72.1% of all the sales were replacement sales (ie, to homes al-

INDEX OF SATURATION

JANUARY 1, 1956

Source of Chart: "Electrical Merchandising"

Number and Percentage of WIRED HOMES WITH		
2,585,000	5.6	AIR CONDITIONERS (room)
5,351,000	11.6	BED COVERINGS
2,346,000	5.1	BLENDERS
5,528,000	12.0	BROILERS
40,235,000	87.5	CLOCKS
14,817,500	32.2	COFFEE MAKERS (automatic)
450,000	1.0	DEHUMIDIFIERS
1,838,000	4.0	DISHWASHERS
4,213,000	9.2	DRYERS, CLOTHES (electric and gas)
2,553,000	5.6	FOOD WASTE DISPOSERS
7,715,000	16.8	FREEZERS
11,675,000	25.4	HEATERS, PORTABLE (electric)
15,639,000	34.0	HEATING PADS
10,140,000	22.0	HOTPLATES
4,217,700	9.2	IRONERS
41,536,500	90.3	IRONS (standard)
16,655,000	36.2	STEAM IRONS
17,467,000	38.0	MIXERS
46,700,000	97.0	**RADIO
12,965,000	28.2	RANGES
43,300,000	94.1	REFRIGERATORS
4,571,000	9.9	ROASTERS
15,410,000	33.5	SANDWICH-WAFFLER (combinations)
19,834,000	43.1	SHAVERS
35,000,000	76.1	*TELEVISION
34,391,000	74.8	TOASTERS
29,586,000	64.3	VACUUM CLEANERS
38,700,000	84.1	WASHERS, ELECTRIC
7,500,000	16.3	WATER HEATERS

*Bureau of Census, June 1955. **Projected from Politz Survey, Jan. 1955

HOW THE MARKET FARED:

	1954			1955			Units	Dollars
	Units	Aver. Price	Retail Value	Units	Aver. Price	Retail Value	% Change 1955 vs 1954	% Change 1955 vs 1954
Air Conditioners, Room	1,230,000	340.89	419,298,000	1,290,000	320.00	412,800,000	+ 4.88%	— 1.55
Bed Coverings	1,050,000	35.95	37,747,500	1,350,000	30.00	40,500,000	+ 28.57	+ 7.29
Blenders	296,000	39.95	11,825,000	405,000	35.59	14,415,000	+ 36.82	+21.90
Broilers	1,550,000	49.00	75,950,000	1,545,000	49.95	77,172,700	— .32	+ 1.61
Cleaners, Vacuum:								
Floor Type	2,658,100	95.73	254,459,900	3,330,000	87.93	292,806,900	+ 25.28	+15.07
Hand Type	133,600	31.03	4,145,600	110,000	31.15	3,426,500	— 17.66	−17.35
Clocks	6,900,000	6.95	47,955,000	7,200,000	6.95	50,040,000	+ 4.35	+ 4.35
Coffee Makers, Total	3,450,000	19.90	68,674,500	3,675,000	19.50	71,662,500	+ 6.52	+ 4.35
Automatic	3,450,000	19.90	68,674,500	3,675,000	19.50	71,662,500	+ 6.52	+ 4.35
Dehumidifiers	76,000	135.00	10,260,000	92,000	129.50	11,914,000	+ 21.05	+16.12
Dishwashers	215,000	300.00	64,500,000	295,000	306.00	90,270,000	+ 37.21	+39.95
Dryers, Clothes, Total	940,900	229.17	215,630,500	1,450,500	220.07	319,197,600	+ 54.16	+48.03
Electric	697,700	219.35	153,040,500	1,085,500	210.37	228,356,600	+ 55.58	+49.21
Gas	243,200	257.36	62,590,000	365,000	248.88	90,841,000	+ 50.08	+45.14
Fans:								
Attic	125,000	131.00	16,375,000	140,000	125.00	17,500,000	+ 12.00	+ 6.87
Desk and Bracket	3,825,000	24.65	94,286,000	2,525,000	19.95	50,373,000	— 33.99	−46.57
Hassock or Floor	360,000	47.50	17,100,000	220,000	48.50	10,670,000	— 38.89	−37.60
Ventilating, Wall & Ceiling	825,000	37.50	30,937,500	860,000	35.00	30,100,000	+ 4.24	— 2.71
Window Ventilating	1,425,000	55.89	79,643,000	1,645,000	49.95	82,168,000	+ 15.44	+ 3.17
Portable Roll-Abouts	175,000	73.00	12,775,000	165,000	77.50	12,787,000	— 5.71	+ .09
Floor Polishers	325,000	60.00	19,500,000	375,000	54.00	20,250,000	+ 15.38	+ 3.85
Food Waste Disposers	400,000	119.95	47,980,000	520,000	119.95	62,374,000	+ 30.00	+30.00
Freezers, Home	990,000	395.00	391,425,000	1,100,000	399.95	439,945,000	+ 11.11	+12.40
Fryers, Deep Fat	1,995,000	21.90	43,690,500	2,275,000	17.50	39,812,500	+ 14.04	— 8.88
Frypan-Skillets	1,100,000	24.03	26,400,000	2,660,000	19.00	50,540,000	+141.82	+91.44
Heaters, Convector & Radiant	1,330,000	25.75	34,232,500	1,535,000	29.40	45,146,000	+ 15.41	+31.88
Fan-Forced & Fan-Htrs.	850,000	19.75	16,787,500	820,000	19.50	15,990,000	— 3.53	— 4.75
Non-Fan Forced	*180,000	13.75	2,475,000	185,000	14.50	2,682,500	+ 2.78	+ 8.38
Wall Type	300,000	49.90	14,970,000	530,000	49.95	26,473,500	+ 76.67	+76.84
Heating Pads	1,675,000	6.50	10,887,500	1,920,000	6.15	11,808,000	+ 14.63	+ 8.45
Hotplates	710,000	8.35	5,928,500	720,000	7.75	5,580,000	+ 1.41	— 5.88
Ironers	89,840	203.60	18,291,000	88,630	210.70	18,674,300	— 1.35	+ 2.10

Source of Table: "Electrical Merchandising

ready owning) and that 45.3% of all sales involved a trade-in. Sales in 1955 pushed saturation up to 94.1% of the nation's 46 million wired homes, giving refrigerators the highest acceptance of any product except radio.

The electric range was another old standby that showed marked improvement. Unlike refrigerators, ranges had been making steady gains ever since a low point in 1952, and the newest increase of 250,000 units put the 1955 total at 1,600,000, an estimated 200,000 of which were built-in units. Another big utility load builder, the water heater, moved up to 900,000 units and a new saturation level of 16.3%.

About the only old-time major appliance still in a decline is the ironer. Sales of 88,630 units in 1955 were the lowest since World War II (the highest: 599,300 in 1947) and indicate that the appliance has almost vanished from the retail store.

As wringer washers continue to decline in sales, automatic models continue the advances they started in the immediate postwar period. Sales of 3,187,000 units in 1955 were the highest on record while conventional machines slid off another 9,000 units to a new postwar low of 1,200,400. Washers had the highest trade-in ratio (47.7%) of any appliance reported in Electrical Merchandising's annual Replacement and Trade-In Survey, even though their replacement percentage, 71.3, was lower than that of refrigerators.

Although the traditional bread-and-butter appliances made healthy gains, newer appliances provided the year's statistical pyrotechnics and were responsible for a major share of the new records. Clothes dryers, for which manufacturers predicted a modest 5% increase, once again confounded the prophets and shot ahead 54.16% to a new peak of 1,450,500 units. Perhaps even more important, electric models, with sales of 1,085,000 units, representing a 55.58% gain, reversed the 1954 trend by growing faster than gas models—whose 50.08% increase gave them a total volume of 365,000 units. Dryer saturation now is 9.2%.

The smallest increase registered by an important new appliance belongs to the air conditioner. Sales of 1,290,000 room units represented a gain of only 4.88% over the 1954 total of 1,230,000. Moreover, a cut in retail prices meant a reduction in dollar volume to $412,800,000 from the previous total of $419,298,000.

Actually, air conditioners had a better year than the figures indicate. Overproduced in 1954, the industry went into 1955 with a carryover inventory of better than 700,000 units, and pre-season estimates were that manufacturers would produce no

Sales of appliances, lamps, radios, and TV in 1955 as compared with 1954

	1954			1955			Units	Dollars
	Units	Aver. Price	Retail Value	Units	Aver. Price	Retail Value	% Change 1955 vs 1954	% Change 1955 vs 1954
Irons, Total:	6,583,300	14.44	95,062,300	8,028,000	14.26	114,798,800	+ 21.94	+20.76
Automatic	2,215,000	10.27	22,748,000	2,520,000	10.25	25,830,000	+ 13.77	+13.55
Non-Automatic	118,300	3.65	431,800	113,000	3.95	446,300	— 4.48	+ 3.36
Traveler	400,000	11.75	4,700,000	295,000	10.50	3,097,500	— 26.25	−34.10
Steam	3,850,000	17.45	67,182,500	5,100,000	16.75	85,425,000	+ 32.47	+27.15
Kitchen Cabinets, Steel	3,372,000		174,440,000	4,046,000		209,328,000	+ 19.99	+20.00
Lamp Bulbs & Tubes, Total:	2,244,068,000		641,700,000	2,450,700,000		751,500,000	+ 9.21	+17.11
Fluorescent	86,168,000		131,000,000	95,700,000		152,000,000	+ 11.06	+16.03
Large Incandescent	1,003,600,000		286,000,000	1,025,000,000		330,000,000	+ 2.13	+15.38
Photo	454,000,000		73,500,000	500,000,000		78,000,000	+ 10.13	+ 6.12
Miniature	377,300,000		118,800,000	470,000,000		156,000,000	+ 24.57	+31.31
Christmas	323,000,000		32,400,000	360,000,000		35,500,000	+ 11.46	+ 9.57
Lawn Mowers, Power	1,350,000	89.70	121,095,000	2,103,100	86.00	180,868,800		
Mixers, Food:								
Standard	1,315,000	44.25	58,188,700	1,615,000	44.25	71,464,000	+ 22.81	+22.81
Portable	925,000	19.50	18,037,500	1,625,000	19.50	31,687,500	+ 75.68	+75.68
Oil Space Heaters	452,000	96.00	43,394,000	410,000	98.00	40,180,000	— 9.29	− 7.41
Radios:								
Home	3,067,600	28.75	88,193,500	3,525,000	28.75	101,343,800	+ 14.91	+14.91
Portable	1,333,500	31.85	42,472,000	2,050,000	34.95	71,647,500	+ 53.73	+68.69
Clock	1,874,900	31.00	58,121,900	2,225,000	33.95	75,538,700	+ 18.67	+29.97
Ranges	1,350,000	262.00	353,700,000	1,600,000	263.00	420,800,000	+ 18.52	+18.97
Refrigerators	3,600,000	305.00	1,095,865,000	4,025,000	315.00	1,267,875,000	+ 11.81	+15.70
Roasters	350,000	39.95	13,982,500	330,000	39.95	13,183,500	— 5.71	− 5.71
Shavers	3,950,000	27.50	108,625,000	4,750,000	25.50	121,125,000	+ 20.25	+11.51
Televison	7,346,700	230.00	1,689,741,000	7,905,000	232.00	1,833,960,000	+ 7.60	+ 8.53
Toasters, Total	3,110,000	16.79	52,226,600	3,350,000	16.81	56,318,000	+ 7.72	+ 7.83
Automatic	2,690,000	18.95	50,975,000	3,035,000	18.25	55,388,000	+ 12.83	+ 8.66
Non-Automatic	420,000	2.98	1,251,600	315,000	2.95	930,000	— 25.00	−25.70
Waffle Irons-Sand. Grills	928,000	18.70	17,354,000	995,000	19.00	18,905,000	+ 7.22	+ 8.94
Washing Machines:								
Automatic & Semi Auto	2,401,000	272.31	653,816,300	3,187,000	268.84	856,793,100	+ 32.74	+31.04
Wringer & Spinner	1,209,400	148.62	179,741,000	1,200,400	146.33	175,654,500	— .74	− 2.27
Water Heaters, Storage	800,000	126.67	101,337,500	900,000	119.95	107,955,000	+ 12.50	+ 6.53
Water Systems	728,000	169.50	123,400,000	788,000	165.00	130,000,000	+ 8.24	+ 5.35

more than 800,000 additional. Because of stocks on hand, dealers were frankly scared. That was one good reason for the price dumping early in the year. Then in July it got hot, and in some places there were actual spot shortages of merchandise. By the end of the year manufacturers had produced about one million units, and stocks left on hand to carry over into 1956 totaled no more than 350,000 (230,000 at dealer and distributor level, 120,000 in factory inventory). The figures meant that dealer sales had jumped about 30% even though factory shipments had increased less than five.

Dehumidifiers had a bigger factory shipment increase than air conditioners, 21.05%. Here again the reason was weather. On July 1 there were some 11,000 dehumidifiers in stock. Three months later the industry's inventory was less than 300. Total sales of 92,000 units for the year isn't a big figure, but it's the biggest this particular industry ever had.

Next to dryers, dishwashers had the biggest sales increase (37.21%) of any appliance, and 1955 was the second year in a row of strong gain. Sales of 295,000 units set a new record. Saturation is still estimated at a low 4%, but the building boom (and builder sales), high consumer income, product improvement, and the public's excited interest in kitchens indicate to many makers that the appliance is finally on the way to consistent big volume sales.

For much the same reasons, food waste disposers also had a big year. Sales of 520,000 units, representing a gain of 30%, topped all previous totals. Like dishwashers, disposers owed a lot of this to builders. More and more builders are using them as features to help sell homes, and manufacturers estimate that at least 50% of disposer sales are made by the construction industry.

Every year somebody expects something to happen to slow down television. But ever since the post-Korean slump of 1951, sales have been increasing steadily, and in 1955 the industry shipped 7,905,000 units for a total retail value of $1,833,960,000, a new record. Unlike 1954, when dollar volume slumped despite an increase in units, retail value increased, too. Obviously, the industry has no debt to those who predicted that the coming of color would hurt black and white sales. Color, in fact, disappointed its optimistic supporters, and it wasn't until close to the end of the year, when sales reached an estimated 1,200 units a week, that it showed any sign of living up to its oft-heralded potential. Total color sales for the year were somewhere in

WHERE THE APPLIANCES WERE BOUGHT

Percentage of Appliances, Radio-TV shipments by Region, Compared with Number of Electric Customers

	Residential & Rural Electric Customers Jan. 1, 1956		Shipments by Percent of U. S. Total								
	Number	% U.S. Total	Washers (8 mos.)	Ironers (8 mos.)	Dryers (8 mos.)	Refrigerators (9 mos.)	Freezers (9 mos.)	Ranges (9 mos.)	Water Heaters (9 mos.)	Television (8 mos.)	Radios (7 Mos.)
New England	2,952,000	6.42	6.00	3.59	4.04	5.54	2.56	6.95	5.14	5.99	7.82
Middle Atlantic	9,035,000	19.64	18.78	15.87	17.00	20.70	11.85	13.75	13.02	19.24	27.68
East North Central	9,625,000	20.92	21.39	35.85	34.72	22.18	19.12	20.17	19.47	19.58	21.98
West North Central	4,280,000	9.31	8.55	12.62	10.59	8.37	14.74	7.98	8.02	8.47	6.78
South Atlantic	6,117,500	13.30	13.41	6.54	6.60	14.45	18.45	21.60	32.50	15.38	11.77
East South Central	2,940,000	6.39	5.98	1.59	2.77	5.81	10.70	8.80	6.17	6.41	4.14
West South Central	4,257,500	9.26	9.54	7.36	4.42	9.11	12.26	4.81	2.08	10.77	6.61
Mountain	1,575,000	3.42	3.71	7.21	3.49	3.08	3.84	4.61	3.84	2.60	2.60
Pacific	5,218,000	11.34	12.64	9.37	16.37	10.76	6.48	11.33	9.76	11.56	10.62
Total	46,000,000	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table prepared by Market Analysis Department of "Electrical Merchandising" on basis of figures compiled by Edison Electric Institute, National Electrical Manufacturers Association, American Home Laundry Manufacturers Association, and Radio-Electronics-Television Manufacturers Association.

the neighborhood of 30,000 sets.

Radio, too, pulled some surprises. At the end of 1954 it was groggy and reeling on the ropes. Then, as the figures show, it floored the pessimists with good increases in all categories. Home radios reached 3,525,000 units, portable radios had their best year since 1948 with 2,050,000 units, and clock radios set a high of 2,225,000.

Housewares Hit $1 Billion

Ever since the end of World War II the electric housewares industry has been talking and dreaming of a $1-billion volume. In 1955 it finally made it, thanks primarily to the vigor of a host of new products. Toasters, waffle irons, mixers, shavers, clocks, and other traditional small items all increased their sales totals, but newer appliances like bed coverings, steam irons, and portable mixers made the most startling contributions. Steam irons, for example, jumped from 3,850,000 to 5,100,000. Deep fat fryers, one of the newest and most spectacular portable appliances, set a record of 2,275,000 units. Portable mixers outsold standard models for the first time with sales of 1,625,000 units. Electric bed coverings passed the million unit mark for the second year in a row with 1,350,000.

Electric space heaters didn't break any postwar records, but total sales of 1,535,000 convector and radiant type units were the best since 1947. Fan forced units dropped off 30,000 units to 820,000, but non-fan and wall type totals of 185,000 and 530,000, respectively, were increases over 1954.

All told, it added up to an exciting year for the appliance industry, but not all the drama was confined to the statistics. Some of the important developments couldn't even be measured. The growing ability of the appliance retailer to cope on even terms with the discount operator was one of these. It only showed up in an attitude of confidence and optimism, was reflected partly in a 26% drop in the number of retail failures.

At the manufacturer level the squeeze was on. The smaller, one-line producers were having tougher and tougher going and many of them were either merging (Whirlpool, Camfield, Mitchell, Stromberg-Carlson) or getting out (Sparks-Withington, International Harvester, Stewart-Warner). Still others were having apparent difficulties (Thor, Servel).

Products themselves provided excitement. First there was the boom in colored appliances, with some manufacturers reporting that as much as 18% of their range production was in color and calmly predicting that it would jump to 30% in 1956. Electronic ranges were announced by three makers (Tappan, GE, Hotpoint), and other producers are on the verge of following suit. Built-in ranges and refrigerators began to take a substantial slice of the business. Refrigerators began to be more and more like freezers—and vice versa. So-called upside down boxes (with a large freezer space at the bottom) were introduced in a number of lines, and one big freezer maker even introduced a combination freezer-refrigerator.

The business still had its problems. Number one on the list, as usual, was price-cutting. Retailers could frequently and easily wax indignant about backdoor selling by distributors. Some retailers were concerned over the ethics of so-called "builder sales"—falsely certifying an over-the-counter sale of a major appliance to a consumer as a sale to a builder and then collecting the additional discount allowed for bona fide sales to builders. Many retailers complained that while sales came easily, dollars came hard.

Utilities Satisfied with Dealers

Although retailers had their problems, power companies seemed satisfied with the job dealers were doing. Of the 254 utilities cooperating in Electrical Merchandising's annual survey, only 91 had plans to merchandise appliances in 1956. The heaviest concentrations of those who will merchandise are in New England (19), West North Central (18), East North Central (17), and the Middle Atlantic (10). In the Pacific region only one out of 40 reporting utilities plans to sell appliances in 1956, and in the Mountain states the figure is only eight out of 57.

Electrical Industry Statistics

52nd Annual Report on the Electrical Industry

CAPITAL EXPENDITURES & BUDGETS — pages 128 to 141 and 171 to 182

	1955	1956†
Fuel Stations	$ 1,230,924,000	$ 1,169,663,000
Hydro Stations	316,568,000	382,768,000
Transmission Plant	570,566,000	681,273,000
Distribution Plant	1,342,653,000	1,457,876,000
Miscellaneous	160,802,000	214,094,000
Total	**$ 3,621,513,000**	**$ 3,905,674,000**
Canadian Construction	$ 364,914,000	$ 523,851,000

OPERATING & FINANCIAL DATA — pages 142 to 155

	1954	1955*
Customers	51,214,559	52,617,000
Sales	410,904,000,000 kwhr	479,000,000,000 kwhr
Revenue	$ 7,277,267,000	$ 8,021,000,000
Average Use per Residential Customer	2,549 kwhr	2,755 kwhr
Power Company		
Electric Revenue	$ 6,310,000,000	$ 6,915,000,000
Operating Expenses	2,875,000,000	3,071,000,000
Taxes	1,437,000,000	1,631,000,000
Net Income	1,151,000,000	1,246,000,000
Dividends	866,000,000	946,000,000
Balance to Surplus	285,000,000	300,000,000
Electric Plant	28,085,000,000	30,500,000,000
Securities Issued	2,348,417,000	1,540,398,000

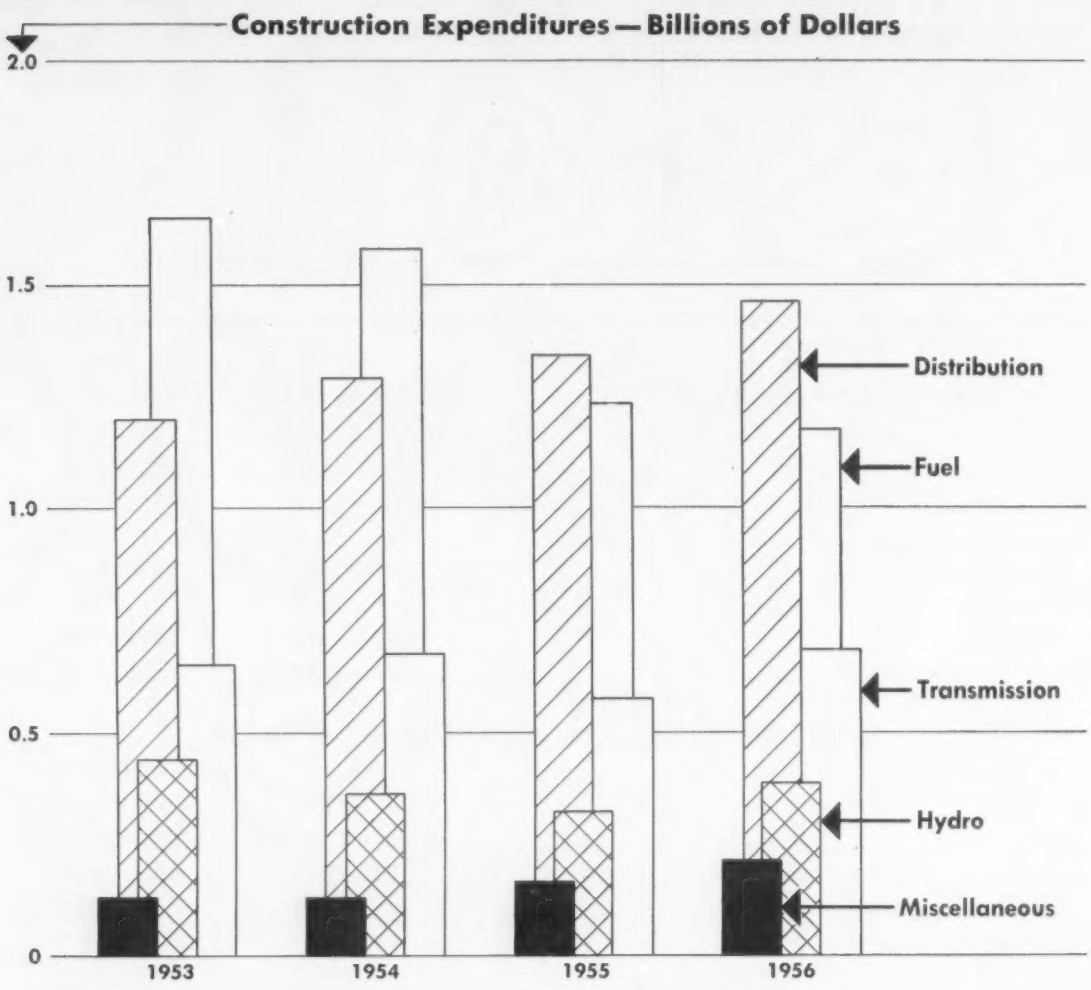
PRODUCTION & CAPACITY — pages 156 to 165

	1954	1955*
Capacity	102,592,410 kw	114,545,000 kw
Production	471,686,354,000 kwhr	546,837,824,000 kwhr
Coal Rate	0.99 lb per kwhr	0.96 lb per kwhr

MANUFACTURING — pages 166 to 170

	1954	1955
Shipments of Electrical Products	$ 15,435,100,000	$ 17,370,200,000

† Prospective. *Estimated



1956 Budget Nears $4 Billion

The nation's electric utilities are planning to spend $3.9 billion for new construction in 1956. That's a 7.8% increase over spending in 1955. Spending for all types of construction will increase.

Generation, still the largest item in utility budgets, 40% of the total, is expected to reach $1.6 billion in 1956. That's only a fraction of 1% greater than 1955. Distribution, second largest item, 37% of the total, is up 8.6% to $1.5 billion. Transmission is up 19.4% to $681 million. Largest growth of any budget category is that labeled "miscellaneous." This includes vehicles, warehousing and stores handling facilities, and office buildings. The 33.1% increase in budgets for these facilities will bring "miscellaneous" spending to $214 million in 1956.

These figures are the result of Electrical World's nationwide survey which this year brought replies from utilities representing 95% of the total capacity and 86% of the total customers served by the industry. All federal agencies were included and, on the basis of capacity, 98% of the power companies, 58% of the cooperatives, and 69% of the municipal, state and power district systems.

Power companies alone will account for over 74% of 1956's total construction, again about the same share they had last year. They will spend about $938 million out of $1.2 billion in fuel capacity additions—more than 80% of the total for new steam plants. And in both distribution and "miscellaneous" construction the power company share will be about the same—again over 80%. It is important to note that expenditures for fuel additions will be about 5% lower this year than last, while hydro will show a 21% increase.

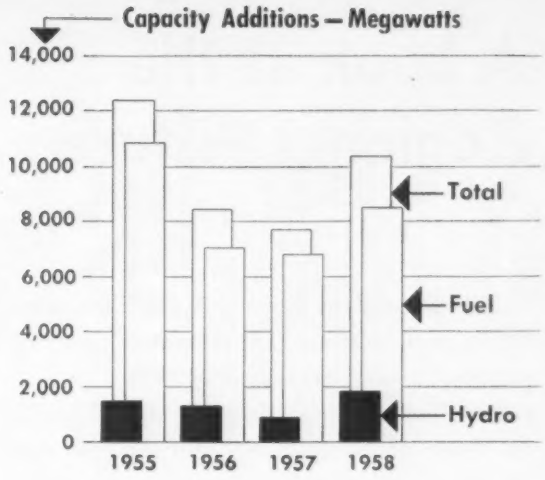
The federal government still spends the lion's share for new hydro. It will spend $173 million, 45% of the total for hydro additions. That's $34.3 million less than it spent for hydro last year.

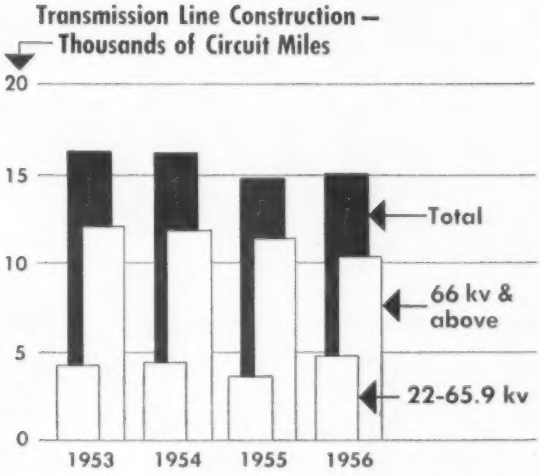
Cooperatives will be spending at pretty nearly the same rate as in 1955, $135 million. Municipal, state, and power district systems on the other hand will increase

Capacity Additions — Megawatts

	1955	1956	1957	1958
Hydro	1,506	1,349	894	1,928
Steam	10,852	7,046	6,756	8,460
IC	29	36	35	41
Total	**12,387**	**8,431**	**7,685**	**10,429**

Source: Electrical World Surveys.





Transmission & Distribution Line Construction

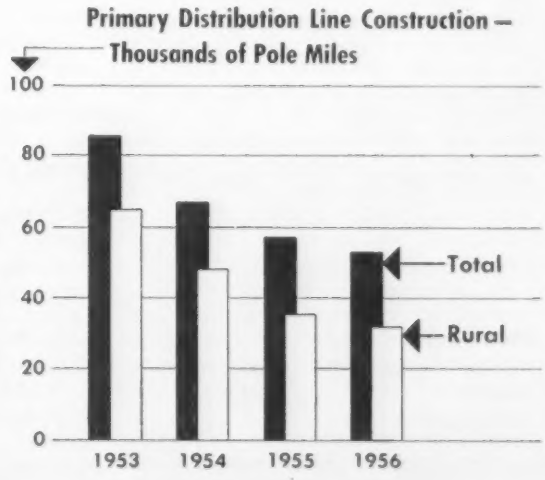
	1953	1954	1955	1956
Transmission Lines — Circuit Miles				
66 kv and above	12,076	11,828	11,262	10,246
22-65.9 kv	4,169	4,373	3,593	4,835
Primary Distribution Lines — Pole Miles				
Total	84,756	66,729	56,519	53,432
Rural	64,557	48,437	34,906	31,754
Underground Construction — Cable Miles				
Transmission	375	429	349	346
Distribution	1,876	2,454	1,690	1,946
Substations — Thousands of Kva	28,154	34,202	30,768	29,847

Source: Electrical World Surveys.

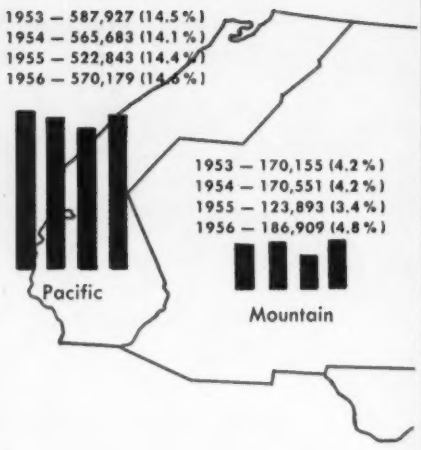
Transmission & Distribution Line Construction — Millions of Dollars

	1953	1954	1955	1956
Transmission Lines				
66 kv and above	258	233	197	219
22-65.9 kv	50	50	43	55
Primary Distribution Lines				
Total	654	457	425	443
Rural	183	150	114	111
Underground Construction				
Transmission	26	28	27	39
Distribution	71	94	64	70
Substations	413	412	362	422

Source: Electrical World Surveys.



A Look at the Regional Picture



Only two regions show cuts in 1956 budgets. All others show increases. In all regions spending for distribution will increase over 1955.

East North Central, despite a drop from 24.7% to 20.9% of the total will still see the greatest spending. Middle Atlantic follows with 16.4%, a 2.5% jump in its share.

Chief reason for a drop in spending in the East South Central is a cut in federal construction which accounted for over one half of the total spending in 1955.

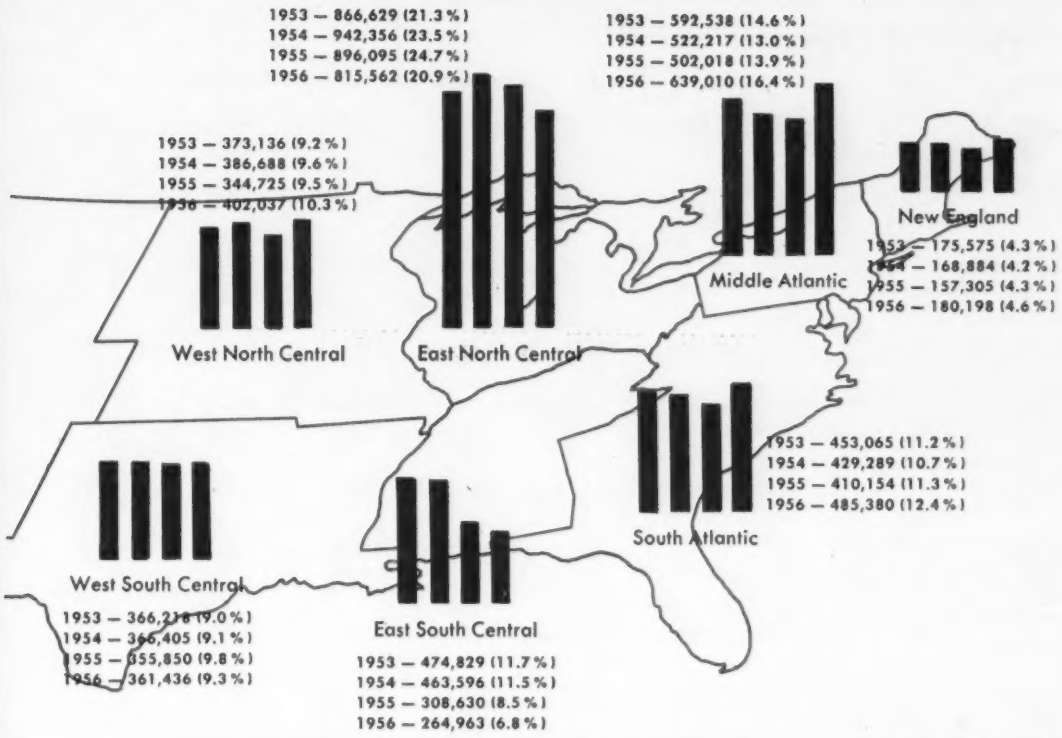
Capital Expenditures — Millions of Dollars

	Generation	Transmission	Distribution	Miscellaneous	Total
1948	1,103	400	1,075	84	2,662
1949	1,410	400	1,190	93	3,093
1950	1,275	425	1,127	109	2,936
1951	1,344	504	1,089	131	3,068
1952	1,925	577	1,118	118	3,738
1953	2,088	647	1,200	127	4,062
1954	1,939	666	1,288	122	4,015
1955	1,547	571	1,343	161	3,622
1956‡	1,553	681	1,458	214	3,906

Source: Electrical World Surveys. ‡Prospective.

Coverage of Electrical World's 1955-1956 Survey

	Percentage of group reporting on basis of:		Group's share of U. S. total:	
	Capacity	Customers	Capacity	Customers
Power Companies	98.0%	96.0%	76.0%	78.5%
Municipal, State and Power District Systems	69.2%	55.0%	8.4%	13.4%
Cooperatives	57.8%	33.7%	0.7%	8.1%
Federal Agencies	100.0%	100.0%	14.9%	0.0%
All Groups	95.0%	86.0%	100.0%	100.0%



Construction — Thousands of Dollars and % Total U. S.

Source: Electrical World Surveys. All bars from left to right: 1953, 1954, 1955, 1956

their expenditures by 46% to approximately $539 million.

Although the budget story must be told in dollars, or more exactly billions of dollars, it is most easily understood when told in terms of plant and equipment being added.

Assuming that there are no major labor troubles, material shortages, or natural disasters, the industry will install 8,431 Mw of generating capacity this year. At that rate the industry would double its present capacity in less than 15 years. But already there are indications that the industry will step up its rate of adding capacity.

Most of the 8,431 Mw of new capacity will go into steam stations, an estimated 7,046 Mw. With economic hydro sites fast disappearing, it is logical that only 1,349 Mw of new water power units will be installed.

The minute 36-Mw remainder will be internal combustion engine-driven.

In general there will be less transmission and distribution mileage built in 1956 than in 1955. The one exception is transmission lines in the 22-65.9-kv classification. The 1956 total will be 4,835 circuit miles, a 34.6% increase over the 3,593 erected in 1955.

Transmission lines of 66 kv and above will drop to 10,246 circuit miles from the 11,262 reported for 1955.

The distribution line picture is being colored by two contrasting shades. On the one hand, rapid development of suburban areas around practically every city and town in the nation has called for equally rapid expansion of distribution systems to serve these areas. On the other hand, the program of bringing electric power to the rural areas is nearing completion. This reduces the need for rural distribution construction.

At present, plans call for the construction of 53,432 circuit miles of primary distribution lines in 1956. The 1955 total was 56,519 circuit miles. Of the total for this year 31,754 miles will be erected to serve rural areas. Here the cooperatives show up strongly. They will erect 19,804 circuit miles or over 62% of the lines being added in the rural classification.

Despite pressure from many groups to put lines underground, there are no indications that the industry is changing its policy of going to underground only when essential, economic, or both. Plans for this year call for the construction of 346 cable miles of underground transmission and 1,946 cable miles of underground distribution. The comparative figures for 1955 were 349 and 1,690. Though the increase this year in underground distribution may appear to be substantial, the 1954 total was 2,454 cable miles.

Substation construction, always closely related to other system construction, is down slightly to 29,847,000 kva from the 30,768,000 kva reported for 1955.

Construction Expenditures — Thousands of Dollars

	1955					
	Fuel	Hydro	Transmission	Distribution	Miscellaneous	Total
New England						
Power Companies	29,645	18,755	25,955	71,615	6,920	152,890
Municipal, State & Power District Systems	64	17	631	3,057	360	4,129
Cooperatives	.....	.....	.....	273	13	286
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**29,709**	**18,772**	**26,586**	**74,945**	**7,293**	**157,305**
Middle Atlantic						
Power Companies	144,460	8,895	58,995	230,690	23,560	466,600
Municipal, State & Power District Systems	2,921	24,000	21	1,716	3,676	32,334
Cooperatives	.....	.....	28	2,848	208	3,084
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**147,381**	**32,895**	**59,044**	**235,254**	**27,444**	**502,018**
East North Central						
Power Companies	424,945	1,130	163,340	225,485	35,660	850,560
Municipal, State & Power District Systems	13,841	51	3,204	15,310	994	33,400
Cooperatives	.....	.....	2,313	8,692	1,130	12,135
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**438,786**	**1,181**	**168,857**	**249,487**	**37,784**	**896,095**
West North Central						
Power Companies	45,555	250	35,825	91,890	10,925	184,445
Municipal, State & Power District Systems	26,240	10	6,007	26,009	4,500	62,766
Cooperatives	.....	.....	10,850	12,460	1,152	24,462
Federal Agencies	.....	63,446	9,606	.....	.....	73,052
Total	**71,795**	**63,706**	**62,288**	**130,359**	**16,577**	**344,725**
South Atlantic						
Power Companies	118,785	14,385	45,815	162,710	14,645	356,340
Municipal, State & Power District Systems	6,579	3	1,837	10,381	391	19,191
Cooperatives	.....	.....	1,984	11,208	648	13,840
Federal Agencies	.....	19,625	1,133	.....	25	20,783
Total	**125,364**	**34,013**	**50,769**	**184,299**	**15,709**	**410,154**
East South Central						
Power Companies	29,500	2,000	15,035	31,585	5,575	83,695
Municipal, State & Power District Systems	1,429	.....	9,048	32,221	3,815	46,513
Cooperatives	2,200	.....	463	15,063	1,552	19,278
Federal Agencies	123,904	13,641	19,332	.....	2,267	159,144
Total	**157,033**	**15,641**	**43,878**	**78,869**	**13,209**	**308,630**
West South Central						
Power Companies	101,350	.....	45,495	113,715	12,240	272,800
Municipal, State & Power District Systems	24,281	.....	2,715	14,718	1,097	42,811
Cooperatives	.....	.....	7,256	19,433	2,567	29,256
Federal Agencies	.....	8,912	2,071	.....	.....	10,983
Total	**125,631**	**8,912**	**57,537**	**147,866**	**15,904**	**355,850**
Mountain						
Power Companies	24,520	1,160	11,645	32,995	4,190	74,510
Municipal, State & Power District Systems	5,302	361	842	10,381	1,023	17,909
Cooperatives	100	.....	7,149	14,537	1,105	22,891
Federal Agencies	.....	2,970	5,390	211	12	8,583
Total	**29,922**	**4,491**	**25,026**	**58,124**	**6,330**	**123,893**
Pacific						
Power Companies	72,855	25,575	31,750	132,630	14,325	277,135
Municipal, State & Power District Systems	32,448	13,210	10,836	46,934	5,677	109,105
Cooperatives	.....	.....	591	3,886	550	5,027
Federal Agencies	.....	98,172	33,404	.....	.....	131,576
Total	**105,303**	**136,957**	**76,581**	**183,450**	**20,552**	**522,843**
Total United States						
Power Companies	991,615	72,150	433,855	1,093,315	128,040	2,718,975
Municipal, State & Power District Systems	113,105	37,652	35,141	160,727	21,533	368,158
Cooperatives	2,300	.....	30,634	88,400	8,925	130,259
Federal Agencies	123,904	206,766	70,936	211	2,304	404,121
Total	**1,230,924**	**316,568**	**570,566**	**1,342,653**	**160,802**	**3,621,513**
U. S. Possessions						
Alaska	1,813	3,111	326	214	470	5,934
Hawaii	2,282	.....	939	2,986	545	6,752
Puerto Rico & Virgin Islands	4,341	6,038	1,898	6,520	876	19,673
Total	**8,436**	**9,149**	**3,163**	**9,720**	**1,891**	**32,359**

	1956					
	Fuel	Hydro	Transmission	Distribution	Miscellaneous	Total
New England						
Power Companies	46,465	11,790	20,175	87,375	10,235	176,040
Municipal, State & Power District Systems	57	.....	744	2,425	678	3,904
Cooperatives	.....	.....	.....	248	6	254
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**46,522**	**11,790**	**20,919**	**90,048**	**10,919**	**180,198**
Middle Atlantic						
Power Companies	161,870	10,275	92,965	251,950	29,900	546,960
Municipal, State & Power District Systems	1,756	70,000	5,831	7,004	4,017	88,608
Cooperatives	.....	.....	228	3,035	179	3,442
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**163,626**	**80,275**	**99,024**	**261,989**	**34,096**	**639,010**
East North Central						
Power Companies	302,290	1,300	141,050	255,375	49,610	749,625
Municipal, State & Power District Systems	20,977	9	10,699	17,265	1,062	50,012
Cooperatives	.....	.....	5,372	9,100	1,453	15,925
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**323,267**	**1,309**	**157,121**	**281,740**	**52,125**	**815,562**
West North Central						
Power Companies	47,555	325	43,030	93,095	14,610	198,615
Municipal, State & Power District Systems	54,209	10	22,908	27,047	5,990	110,164
Cooperatives	3,500	.....	3,479	11,554	1,088	19,621
Federal Agencies	.....	55,239	18,398	.....	.....	73,637
Total	**105,264**	**55,574**	**87,815**	**131,696**	**21,688**	**402,037**
South Atlantic						
Power Companies	168,845	1,800	67,480	175,475	19,330	432,930
Municipal, State & Power District Systems	9,999	1	245	11,718	46	22,009
Cooperatives	.....	.....	528	11,272	412	12,212
Federal Agencies	.....	16,606	1,598	.....	25	18,229
Total	**178,844**	**18,407**	**69,851**	**198,465**	**19,813**	**485,380**
East South Central						
Power Companies	30,280	2,660	20,100	32,710	4,175	89,925
Municipal, State & Power District Systems	639	.....	14,363	33,098	2,537	50,637
Cooperatives	6,600	.....	770	15,095	1,636	24,101
Federal Agencies	66,417	10,901	20,762	.....	2,220	100,300
Total	**103,936**	**13,561**	**55,995**	**80,903**	**10,568**	**264,963**
West South Central						
Power Companies	82,955	.....	49,900	118,115	20,035	271,005
Municipal, State & Power District Systems	16,951	.....	2,093	20,008	1,825	40,877
Cooperatives	1,300	.....	12,652	19,565	1,891	35,408
Federal Agencies	.....	13,439	707	.....	.....	14,146
Total	**101,206**	**13,439**	**65,352**	**157,688**	**23,751**	**361,436**
Mountain						
Power Companies	26,290	24,195	19,935	38,990	4,490	113,900
Municipal, State & Power District Systems	21,420	273	900	9,754	3,400	35,747
Cooperatives	170	.....	5,803	11,056	1,294	18,323
Federal Agencies	.....	6,887	11,818	224	10	18,939
Total	**47,880**	**31,355**	**38,456**	**60,024**	**9,194**	**186,909**
Pacific						
Power Companies	71,705	60,215	40,910	134,210	19,250	326,290
Municipal, State & Power District Systems	27,413	27,388	12,771	57,015	12,004	136,591
Cooperatives	.....	.....	963	4,098	686	5,747
Federal Agencies	.....	69,455	32,096	.....	.....	101,551
Total	**99,118**	**157,058**	**86,740**	**195,323**	**31,940**	**570,179**
Total United States						
Power Companies	938,255	112,560	495,545	1,187,295	171,635	2,905,290
Municipal, State & Power District Systems	153,421	97,681	70,554	185,334	31,559	538,549
Cooperatives	11,570	.....	29,795	85,023	8,645	135,033
Federal Agencies	66,417	172,527	85,379	224	2,255	326,802
Total	**1,169,663**	**382,768**	**681,273**	**1,457,876**	**214,094**	**3,905,674**
U. S. Possessions						
Alaska	2,156	6	828	300	16	3,306
Hawaii	3,389	37	1,145	3,161	261	7,993
Puerto Rico & Virgin Islands	8,226	3,526	5,040	8,778	1,766	27,336
Total	**13,771**	**3,569**	**7,013**	**12,239**	**2,043**	**38,635**

Transmission & Distribution Construction

1955

	Transmission—Circuit Miles		Underground—Cable Miles		Primary Distribution—Pole Miles		Substations
	66 kv & up	22-65.9 kv	Transmission	Distribution	Total	Rural	kva
New England							
Power Companies	150	90	50	200	1,090	200	1,225,000
Municipal, State & Power District Systems	...	1	4	37	268	8	58
Cooperatives	...	...	...	...	33	33	...
Federal Agencies	...	...	...	...	...	...	...
Total	**150**	**91**	**54**	**237**	**1,391**	**241**	**1,225,058**
Middle Atlantic							
Power Companies	340	455	90	489	3,345	1,070	3,465,000
Municipal, State & Power District Systems	1	...	...	5	29	...	11
Cooperatives	...	14	...	...	417	417	28,000
Federal Agencies	...	...	...	...	...	...	...
Total	**341**	**469**	**90**	**494**	**3,791**	**1,487**	**3,493,011**
East North Central							
Power Companies	1,760	810	117	234	5,520	1,190	6,842,300
Municipal, State & Power District Systems	2	5	24	62	158	33	197
Cooperatives	240	88	...	...	1,549	1,549	40,000
Federal Agencies	...	...	...	...	...	...	...
Total	**2,002**	**903**	**141**	**296**	**7,227**	**2,772**	**6,882,497**
West North Central							
Power Companies	800	360	1	95	2,100	770	1,585,000
Municipal, State & Power District Systems	150	187	11	57	235	197	334
Cooperatives	1,204	184	...	16	4,138	4,138	196,000
Federal Agencies	294	...	...	...	...	...	430,986
Total	**2,448**	**731**	**12**	**168**	**6,473**	**5,105**	**2,212,320**
South Atlantic							
Power Companies	1,035	340	9	108	6,000	3,015	3,695,000
Municipal, State & Power District Systems	...	29	...	70	1,346	619	125
Cooperatives	20	124	...	...	1,941	1,941	66,000
Federal Agencies	...	...	...	...	...	...	23,383
Total	**1,055**	**493**	**9**	**178**	**9,287**	**5,575**	**3,784,508**
East South Central							
Power Companies	261	77	...	5	1,555	640	1,180,535
Municipal, State & Power District Systems	55	50	...	37	814	339	229
Cooperatives	27	25	...	...	3,206	3,206	57,000
Federal Agencies	440	27	...	...	...	...	3,337,050
Total	**783**	**179**	...	**42**	**5,575**	**4,185**	**4,574,814**
West South Central							
Power Companies	1,105	165	...	68	4,480	1,800	3,540,000
Municipal, State & Power District Systems	39	3	...	37	414	41	91
Cooperatives	588	...	...	...	5,016	5,016	77,000
Federal Agencies	...	...	...	...	...	...	97,250
Total	**1,732**	**168**	...	**105**	**9,910**	**6,857**	**3,714,341**
Mountain							
Power Companies	475	205	...	25	1,500	710	1,170,000
Municipal, State & Power District Systems	32	13	...	1	291	...	84
Cooperatives	834	71	...	...	5,897	5,897	179,000
Federal Agencies	39	...	...	...	29	26	187,602
Total	**1,380**	**289**	...	**26**	**7,717**	**6,633**	**1,536,686**
Pacific							
Power Companies	695	95	...	107	4,150	1,430	1,510,000
Municipal, State & Power District Systems	202	126	43	37	567	190	1,339
Cooperatives	15	49	...	...	431	431	59,000
Federal Agencies	459	...	...	...	...	...	1,774,654
Total	**1,371**	**270**	**43**	**144**	**5,148**	**2,051**	**3,344,993**
Total United States							
Power Companies	6,621	2,597	267	1,331	29,740	10,825	24,212,835
Municipal, State & Power District Systems	481	414	82	343	4,122	1,427	2,468
Cooperatives	2,928	555	...	16	22,628	22,628	702,000
Federal Agencies	1,232	27	...	...	29	26	5,850,925
Total	**11,262**	**3,593**	**349**	**1,690**	**56,519**	**34,906**	**30,768,228**
U.S. Possessions							
Alaska	...	...	...	...	4	...	8
Hawaii	...	13	2	17	149	24	22
Puerto Rico & Virgin Islands	...	8	...	...	351	162	72
Total	...	**21**	**2**	**17**	**504**	**186**	**102**

1956

	Transmission—Circuit Miles		Underground—Cable Miles		Primary Distribution—		
	66 kv & up	22-65.9 kv	Transmission	Distribution	Pole Miles Total	Pole Miles Rural	Substations kva
New England							
Power Companies	135	195	10	215	1,140	215	1,157,500
Municipal, State & Power District Systems	4	...	1	31	54	11	25
Cooperatives	...	...	...	...	39	39	450
Federal Agencies	...	...	...	...	...	...	...
Total	**139**	**195**	**11**	**246**	**1,233**	**265**	**1,157,975**
Middle Atlantic							
Power Companies	550	400	147	560	3,130	1,025	2,850,000
Municipal, State & Power District Systems	...	...	...	12	58	...	41
Cooperatives	...	...	...	...	435	435	25,000
Federal Agencies	...	...	...	...	...	...	...
Total	**550**	**400**	**147**	**572**	**3,623**	**1,460**	**2,875,041**
East North Central							
Power Companies	1,530	800	89	379	5,445	1,125	7,055,000
Municipal, State & Power District Systems	42	5	32	51	158	41	372
Cooperatives	118	122	...	...	1,527	1,527	417,000
Federal Agencies	...	...	...	...	...	...	...
Total	**1,690**	**927**	**121**	**430**	**7,130**	**2,693**	**7,472,372**
West North Central							
Power Companies	850	425	...	75	2,105	795	2,200,000
Municipal, State & Power District Systems	395	159	20	43	215	217	576
Cooperatives	298	189	...	28	3,574	3,574	68,000
Federal Agencies	258	...	...	...	...	...	399,000
Total	**1,801**	**773**	**20**	**146**	**5,894**	**4,586**	**2,667,576**
South Atlantic							
Power Companies	1,385	630	21	125	6,210	3,015	3,615,000
Municipal, State & Power District Systems	...	22	1	56	1,346	478	287
Cooperatives	...	124	...	...	1,830	1,830	42,000
Federal Agencies	...	...	...	...	...	...	204,000
Total	**1,385**	**776**	**22**	**181**	**9,386**	**5,323**	**3,861,287**
East South Central							
Power Companies	290	126	1	6	1,635	670	875,400
Municipal, State & Power District Systems	74	72	...	29	664	288	403
Cooperatives	...	26	...	...	3,264	3,264	23,000
Federal Agencies	250	70	...	...	...	...	1,513,500
Total	**614**	**294**	**1**	**35**	**5,563**	**4,222**	**2,412,303**
West South Central							
Power Companies	1,205	130	2	62	4,260	1,735	3,085,000
Municipal, State & Power District Systems	46	...	...	48	476	41	219
Cooperatives	1,140	180	...	...	4,938	4,938	153,000
Federal Agencies	...	...	...	...	...	...	...
Total	**2,391**	**310**	**2**	**110**	**9,674**	**6,714**	**3,238,219**
Mountain							
Power Companies	430	170	...	19	1,575	690	890,000
Municipal, State & Power District Systems	23	10	...	16	318	30	83
Cooperatives	147	675	...	...	3,902	3,902	209,000
Federal Agencies	96	2	...	39	33	...	119,500
Total	**696**	**857**	...	**74**	**5,828**	**4,622**	**1,218,583**
Pacific							
Power Companies	615	110	...	112	4,230	1,400	1,765,000
Municipal, State & Power District Systems	167	137	22	40	576	174	981
Cooperatives	8	56	...	...	295	295	92,000
Federal Agencies	190	...	...	...	...	...	3,086,000
Total	**980**	**303**	**22**	**152**	**5,101**	**1,869**	**4,943,981**
Total United States							
Power Companies	6,990	2,986	270	1,553	29,730	10,670	23,492,900
Municipal, State & Power District Systems	751	405	76	326	3,865	1,280	2,987
Cooperatives	1,711	1,372	...	28	19,804	19,804	1,029,450
Federal Agencies	794	72	...	39	33	...	5,322,000
Total	**10,246**	**4,835**	**346**	**1,946**	**53,432**	**31,754**	**29,847,337**
U.S. Possessions							
Alaska	...	8	...	...	79	1	24
Hawaii	...	15	3	22	39	25	70
Puerto Rico & Virgin Islands	60	12	9	...	395	177	53
Total	**60**	**35**	**12**	**22**	**513**	**203**	**147**

Transmission & Distribution Expenditures — Thousands of Dollars

1955

	Transmission Lines		Underground Construction		Primary Distribution		Substations
	66 kv & up	22-65.9 kv	Transmission	Distribution	Total	Rural	
New England							
Power Companies	5,945	2,795	3,145	6,000	12,640	860	12,965
Municipal, State & Power District Systems	...	6	145	350	271	30	575
Cooperatives	...	...	...	...	86	86	...
Federal Agencies	...	...	...	...	...	...	...
Total	**5,945**	**2,801**	**3,290**	**6,350**	**12,997**	**976**	**13,540**
Middle Atlantic							
Power Companies	13,715	8,275	9,840	22,020	41,375	6,420	51,730
Municipal, State & Power District Systems	49	...	...	74	259	...	163
Cooperatives	...	28	...	...	996	996	567
Federal Agencies	...	...	...	...	...	...	...
Total	**13,764**	**8,303**	**9,840**	**22,094**	**42,630**	**7,416**	**52,460**
East North Central							
Power Companies	47,975	12,770	7,365	9,990	86,270	10,390	81,575
Municipal, State & Power District Systems	16	2	640	1,155	1,962	112	992
Cooperatives	2,885	482	...	...	4,802	4,802	1,182
Federal Agencies	...	...	...	...	...	...	...
Total	**50,876**	**13,254**	**8,005**	**11,145**	**93,034**	**15,304**	**83,749**
West North Central							
Power Companies	13,075	3,725	365	7,890	26,860	5,815	22,650
Municipal, State & Power District Systems	989	926	25	1,318	6,416	588	6,294
Cooperatives	6,556	670	...	62	6,944	6,944	5,096
Federal Agencies	3,410	...	...	...	...	...	6,195
Total	**24,030**	**5,321**	**390**	**9,270**	**40,220**	**13,347**	**40,235**
South Atlantic							
Power Companies	19,115	3,765	1,085	4,700	67,860	14,790	35,070
Municipal, State & Power District Systems	...	303	...	129	3,696	917	1,967
Cooperatives	200	460	...	...	5,287	5,287	1,771
Federal Agencies	50	...	...	...	...	...	1,283
Total	**19,365**	**4,528**	**1,085**	**4,829**	**76,843**	**20,994**	**40,091**
East South Central							
Power Companies	4,145	1,395	20	130	6,780	1,570	12,055
Municipal, State & Power District Systems	1,757	274	...	519	8,044	1,521	2,696
Cooperatives	137	113	...	...	7,441	7,441	1,205
Federal Agencies	5,775	400	...	...	...	...	12,478
Total	**11,814**	**2,182**	**20**	**649**	**22,265**	**10,532**	**28,434**
West South Central							
Power Companies	17,805	2,180	...	2,780	35,375	8,240	26,920
Municipal, State & Power District Systems	795	115	...	375	2,967	92	502
Cooperatives	3,880	...	...	...	11,431	11,431	2,002
Federal Agencies	...	...	...	...	...	...	1,425
Total	**22,480**	**2,295**	...	**3,155**	**49,773**	**19,763**	**30,849**
Mountain							
Power Companies	6,375	1,050	...	478	13,220	4,010	8,850
Municipal, State & Power District Systems	274	19	...	29	919	...	1,245
Cooperatives	4,558	402	...	...	10,768	10,768	5,364
Federal Agencies	1,283	...	...	...	111	103	4,103
Total	**12,490**	**1,471**	...	**507**	**25,018**	**14,881**	**19,562**
Pacific							
Power Companies	16,310	1,245	...	2,940	49,805	8,630	18,315
Municipal, State & Power District Systems	3,305	1,483	4,394	3,360	11,058	736	17,854
Cooperatives	61	419	...	...	1,167	1,167	591
Federal Agencies	16,086	...	...	...	...	...	16,525
Total	**35,762**	**3,147**	**4,394**	**6,300**	**62,030**	**10,533**	**53,285**
Total United States							
Power Companies	144,460	37,200	21,820	56,928	340,185	60,725	270,130
Municipal, State & Power District Systems	7,185	3,128	5,204	7,309	35,592	3,996	32,288
Cooperatives	18,277	2,574	...	62	48,922	48,922	17,778
Federal Agencies	26,604	400	...	...	111	103	42,009
Total	**196,526**	**43,302**	**27,024**	**64,299**	**424,810**	**113,746**	**362,205**
U.S. Possessions							
Alaska	70	...	...	9	32	1	152
Hawaii	...	136	193	425	798	114	562
Puerto Rico & Virgin Islands	529	812	281	20	5,040	2,348	...
Total	**599**	**948**	**474**	**454**	**5,871**	**2,463**	**714**

1956

	Transmission Lines		Underground Construction		Primary Distribution		Substations
	66 kv & up	22-65.9 kv	Transmission	Distribution	Total	Rural	
New England							
Power Companies	4,460	3,800	635	6,365	14,475	935	12,330
Municipal, State & Power District Systems	24	1	20	375	298	35	415
Cooperatives	...	...	...	...	111	111	22
Federal Agencies	...	...	...	...	...	...	...
Total	**4,484**	**3,801**	**655**	**6,740**	**14,884**	**1,081**	**12,767**
Middle Atlantic							
Power Companies	25,015	8,230	16,710	24,550	44,550	6,200	57,100
Municipal, State & Power District Systems	...	...	...	149	543	...	1,441
Cooperatives	...	...	...	...	1,085	1,085	565
Federal Agencies	...	...	...	...	...	...	...
Total	**25,015**	**8,230**	**16,710**	**24,699**	**46,178**	**7,285**	**59,106**
East North Central							
Power Companies	41,310	12,850	9,290	13,330	93,760	10,735	101,195
Municipal, State & Power District Systems	893	64	2,168	1,165	1,957	125	904
Cooperatives	1,573	684	...	...	4,505	4,505	4,177
Federal Agencies	...	...	...	...	...	...	...
Total	**43,776**	**13,598**	**11,458**	**14,495**	**100,222**	**15,365**	**106,276**
West North Central							
Power Companies	14,050	4,810	550	6,545	29,310	6,650	29,825
Municipal, State & Power District Systems	6,159	1,435	75	1,113	7,013	1,020	18,146
Cooperatives	1,684	631	...	80	6,916	6,916	2,785
Federal Agencies	4,784	...	...	...	...	...	13,614
Total	**26,677**	**6,876**	**625**	**7,738**	**43,239**	**14,586**	**64,370**
South Atlantic							
Power Companies	23,130	7,650	6,910	5,580	71,000	15,700	37,040
Municipal, State & Power District Systems	...	100	...	139	2,022	657	517
Cooperatives	...	400	...	...	4,756	4,756	800
Federal Agencies	25	...	...	...	...	...	1,542
Total	**23,155**	**8,150**	**6,910**	**5,719**	**77,778**	**21,113**	**39,899**
East South Central							
Power Companies	6,320	1,630	60	160	7,355	1,660	11,200
Municipal, State & Power District Systems	2,381	939	90	1,018	9,285	1,617	5,129
Cooperatives	...	130	...	...	7,563	7,563	543
Federal Agencies	5,700	300	...	...	...	...	14,017
Total	**14,401**	**2,999**	**150**	**1,178**	**24,203**	**10,840**	**30,889**
West South Central							
Power Companies	23,350	1,865	400	2,280	33,130	7,780	26,700
Municipal, State & Power District Systems	654	...	...	503	4,316	122	1,217
Cooperatives	7,921	403	...	...	11,180	11,180	4,441
Federal Agencies	...	...	...	...	...	...	...
Total	**31,925**	**2,268**	**400**	**2,783**	**48,626**	**19,082**	**32,358**
Mountain							
Power Companies	7,230	2,695	38	410	14,870	4,070	9,640
Municipal, State & Power District Systems	195	48	...	67	1,135	54	954
Cooperatives	588	2,360	...	...	7,786	7,786	5,639
Federal Agencies	2,238	4	...	...	134	120	2,630
Total	**10,251**	**5,107**	**38**	**477**	**23,925**	**12,030**	**18,863**
Pacific							
Power Companies	14,620	1,655	...	3,045	51,130	8,350	26,675
Municipal, State & Power District Systems	5,662	1,866	2,052	3,420	12,398	619	17,147
Cooperatives	107	348	...	...	915	915	1,283
Federal Agencies	19,307	...	...	...	...	...	12,789
Total	**39,696**	**3,869**	**2,052**	**6,465**	**64,443**	**9,884**	**57,894**
Total United States							
Power Companies	159,485	45,185	34,593	62,265	359,580	62,080	311,705
Municipal, State & Power District Systems	15,968	4,453	4,405	7,949	38,967	4,249	45,870
Cooperatives	11,873	4,956	...	80	44,817	44,817	20,255
Federal Agencies	32,054	304	...	...	134	120	44,592
Total	**219,380**	**54,898**	**38,998**	**70,294**	**443,498**	**111,266**	**422,422**
U.S. Possessions							
Alaska	...	126	...	15	463	7	345
Hawaii	...	187	...	...	816	122	871
Puerto Rico & Virgin Islands	2,072	1,357	1,178	20	4,364	3,259	...
Total	**2,072**	**1,670**	**1,178**	**35**	**5,643**	**3,388**	**1,216**

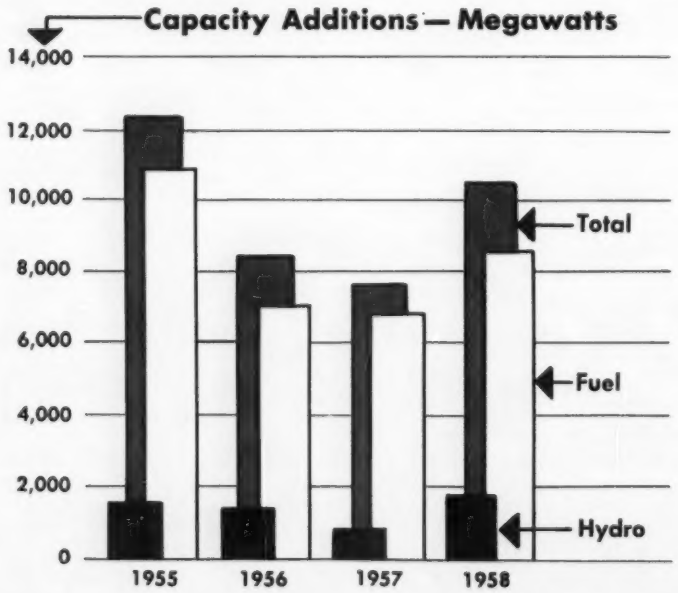
NEW CAPACITY

Capacity Additions Reported to Electrical World—Kw†

	1955	1956	1957	1958	After 1958
Hydro					
Power Companies	336,175	246,200	111,000	586,200	2,635,000
Municipal, State and Power District Systems	67,250	41,200	93,990	536,000	1,588,000
Cooperatives	.....	.....	.....	30,000	12,000
Federal Agencies	1,102,600	1,061,833	689,166	775,400	4,280,100
Total	**1,506,025**	**1,349,233**	**894,156**	**1,927,600**	**8,515,100**
Steam					
Power Companies	7,842,850	5,476,900	6,130,800	7,614,250	6,213,100
Municipal, State and Power District Systems	486,780	572,175	593,500	785,000	1,573,250
Cooperatives	22,000	146,875	31,500	60,500	61,000
Federal Agencies	2,500,000	850,000	.....	.....	.....
Total	**10,851,630**	**7,045,950**	**6,755,800**	**8,459,750**	**7,847,350**
Internal Combustion					
Power Companies	5,210	1,300	4,000	29,000	.....
Municipal, State and Power District Systems	21,583	24,723	19,810	12,355	18,005
Cooperatives	2,300	9,645	11,465	.....	7,335
Federal Agencies	.....	.....	.....	.....	.....
Total	**29,093**	**35,668**	**35,275**	**41,355**	**25,340**
Total					
Power Companies	8,184,235	5,724,400	6,245,800	8,229,450	8,848,100
Municipal, State and Power District Systems	575,613	638,098	707,300	1,333,355	3,179,255
Cooperatives	24,300	156,520	42,965	90,500	80,335
Federal Agencies	3,602,600	1,911,833	689,166	775,400	4,280,100
Total	**12,386,748**	**8,430,851**	**7,685,231**	**10,428,705**	**16,387,790**

Source: "Electrical World" Surveys. †Maximum rated capability.

Industry's Plans Call for 43,000 Mw



As revealed by last year's survey, 1955 saw record new capacity additions—12,387 Mw. This year's survey indicates that 1958 will approach or even surpass this record. That's possible if 1958 shows an increase in plans anywhere near the 2,500 Mw increase in plans that 1957 saw between last year's and this year's survey. A similar 2,500 Mw increase in planning would put 1958's additions at the 12,900 Mw level.

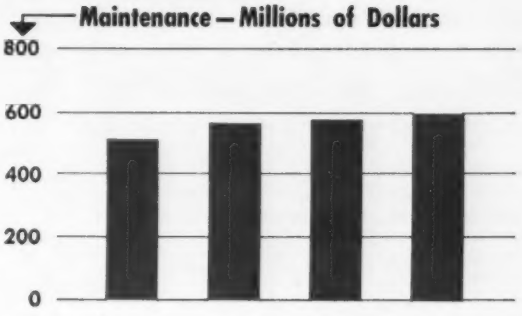
Important is the high level of planning for the years "after 1958"—16,388 Mw. That's 38% of today's total planning. Power companies account for more than half of this more advanced planning.

Capacity additions recently reported to Electrical World are at maximum rated capability. Details of this study, giving data for individual utilities, can be found on pages 171 to 182.

$597 Million for Maintenance

Electric utilities will spend $21 million more for maintenance in 1956 than they did in 1955. That's approximately a 4% increase and will bring total spending for maintenance to $597 million. Power companies will spend most of this, over 80%.

Of each dollar a power company will spend on maintenance, about 48¢ will be spent on maintaining distribution facilities, about 39¢ will go for maintaining generating plants, and 9¢ will be used for transmission maintenance. The remainder, about 4¢, will be spent to maintain general property, such as office buildings and service facilities.



Maintenance — Thousands of Dollars

	1955	1956
New England		
Power Companies	34,780	38,550
Municipal, State & Power District Systems	493	476
Cooperatives	74	53
Federal Agencies	.....	.....
Total	**35,347**	**39,079**
Middle Atlantic		
Power Companies	140,000	142,210
Municipal, State & Power District Systems	856	881
Cooperatives	403	454
Federal Agencies	.....	.....
Total	**141,259**	**143,545**
East North Central		
Power Companies	122,115	129,250
Municipal, State & Power District Systems	7,998	8,106
Cooperatives	3,847	4,001
Federal Agencies	35	35
Total	**133,995**	**141,392**
West North Central		
Power Companies	31,910	31,780
Municipal, State & Power District Systems	10,001	10,230
Cooperatives	5,834	6,534
Federal Agencies	484	678
Total	**48,229**	**49,222**
South Atlantic		
Power Companies	56,565	58,080
Municipal, State & Power District Systems	1,956	1,980
Cooperatives	1,929	2,180
Federal Agencies	487	517
Total	**60,937**	**62,757**
Alaska	97	70
Hawaii	1,974	2,002

	1955	1956
East South Central		
Power Companies	12,615	13,500
Municipal, State & Power District Systems	10,425	11,228
Cooperatives	3,298	3,727
Federal Agencies	10,428	12,429
Total	**36,766**	**40,884**
West South Central		
Power Companies	34,270	35,230
Municipal, State & Power District Systems	2,445	3,055
Cooperatives	6,528	7,442
Federal Agencies	586	586
Total	**43,829**	**46,313**
Mountain		
Power Companies	10,655	10,250
Municipal, State & Power District Systems	1,474	1,521
Cooperatives	1,743	1,886
Federal Agencies	2,833	3,140
Total	**16,705**	**16,797**
Pacific		
Power Companies	35,335	32,630
Municipal, State & Power District Systems	17,935	18,532
Cooperatives	486	515
Federal Agencies	4,729	5,306
Total	**58,485**	**56,983**
Total United States		
Power Companies	478,245	491,480
Municipal, State & Power District Systems	53,583	56,009
Cooperatives	24,142	26,792
Federal Agencies	19,582	22,691
Total	**575,552**	**596,972**
U. S. Possessions		
Puerto Rico & Virgin Islands	1,745	2,155
Total	**3,816**	**4,227**

Canada's Budget Tops $523 Million

Canadian utilities plan capital expenditures of more than $523 million in 1956—a jump of 43.6% over the $365 spent in 1955. Over $270 million will go for new generation.

Canada's construction budget for 1956 will be over $523 million—an increase of $159 million over 1955. Headlining the budget is $270 million slated to go into new generating facilities. As in past years, hydro plants have been allotted the bulk of this—roughly $231 million or

	Total Canada	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick	Quebec
Electric Plant Construction—Thousands of Dollars						
Fuel 1955	23,196	980	425	2,951	1,942	601
1956	39,036	300	450	2,300	3,000	...
Hydro 1955	142,235	385	150	1,820	5,000	44,995
1956	231,314	1,377	...	1,775	7,000	40,018
Transmission 1955	87,410	1,155	98	1,582	2,262	31,139
1956	115,174	291	100	2,982	3,066	35,876
Distribution 1955	91,195	532	332	1,528	477	23,738
1956	108,481	571	234	2,196	477	31,586
Miscellaneous 1955	20,878	264	...	469	450	1,985
1956	29,846	98	...	1,194	1,250	4,747
Total 1955	**364,914**	**3,316**	**1,005**	**8,350**	**10,131**	**102,458**
1956	**523,851**	**2,637**	**784**	**10,447**	**14,793**	**112,227**
Maintenance—Thousands of Dollars						
1955	51,859	883	115	1,011	2,387	10,892
1956	57,453	925	100	933	2,225	11,629
Line & Substation Construction—Thousands of Dollars						
Transmission Line						
66 kv & up 1955	53,152	100	...	375	1,700	28,688
1956	51,234	...	...	1,306	2,000	26,370
22-65.9 kv 1955	6,924	287	11	111	...	613
1956	8,394	40	...	420	...	813
Underground						
Transmission 1955	1,832	290	...	...	...	...
1956	8,964	...	...	...	...	22
Distribution 1955	4,454	...	...	1	19	1,928
1956	4,208	35	...	2	26	1,523
Primary Distribution Line						
Total 1955	25,831	34	304	390	350	1,527
1956	25,387	48	204	662	350	1,498
Rural 1955	16,808	18	304	390	350	943
1956	15,620	13	204	662	350	816
Substations 1955	43,965	77	28	114	500	7,086
1956	75,241	...	30	118	500	24,535
Line & Substation Construction						
Transmission Line—Circuit Miles						
66 kv & up 1955	1,641	14	...	42	105	594
1956	2,091	...	...	120	140	749
22-65.9 kv 1955	904	158	...	16	...	78
1956	979	17	...	48	...	93
Underground—Cable Miles						
Transmission 1955	28	4	...	...	...	...
1956	51	...	...	...	...	1
Distribution 1955	313	120	...	1	1	61
1956	336	133	...	1	2	76
Primary Distribution—Pole Miles						
Total 1955	16,609	12	153	162	194	588
1956	17,051	10	103	268	194	573
Rural 1955	14,133	10	153	162	194	396
1956	13,586	7	103	268	194	344
Substations—Thousands of kva						
1955	3,362	15	3	18	50	698
1956	11,522	...	4	25	50	7,086

for 1956—$231 Million for Hydro

over 44% of the total budget.

Although fuel plant expenditures are a relatively small part of the total, they are increasing. More than $39 million will be invested in these plants in 1956. This represents an increase of 68% over 1955 and of 254% over 1954.

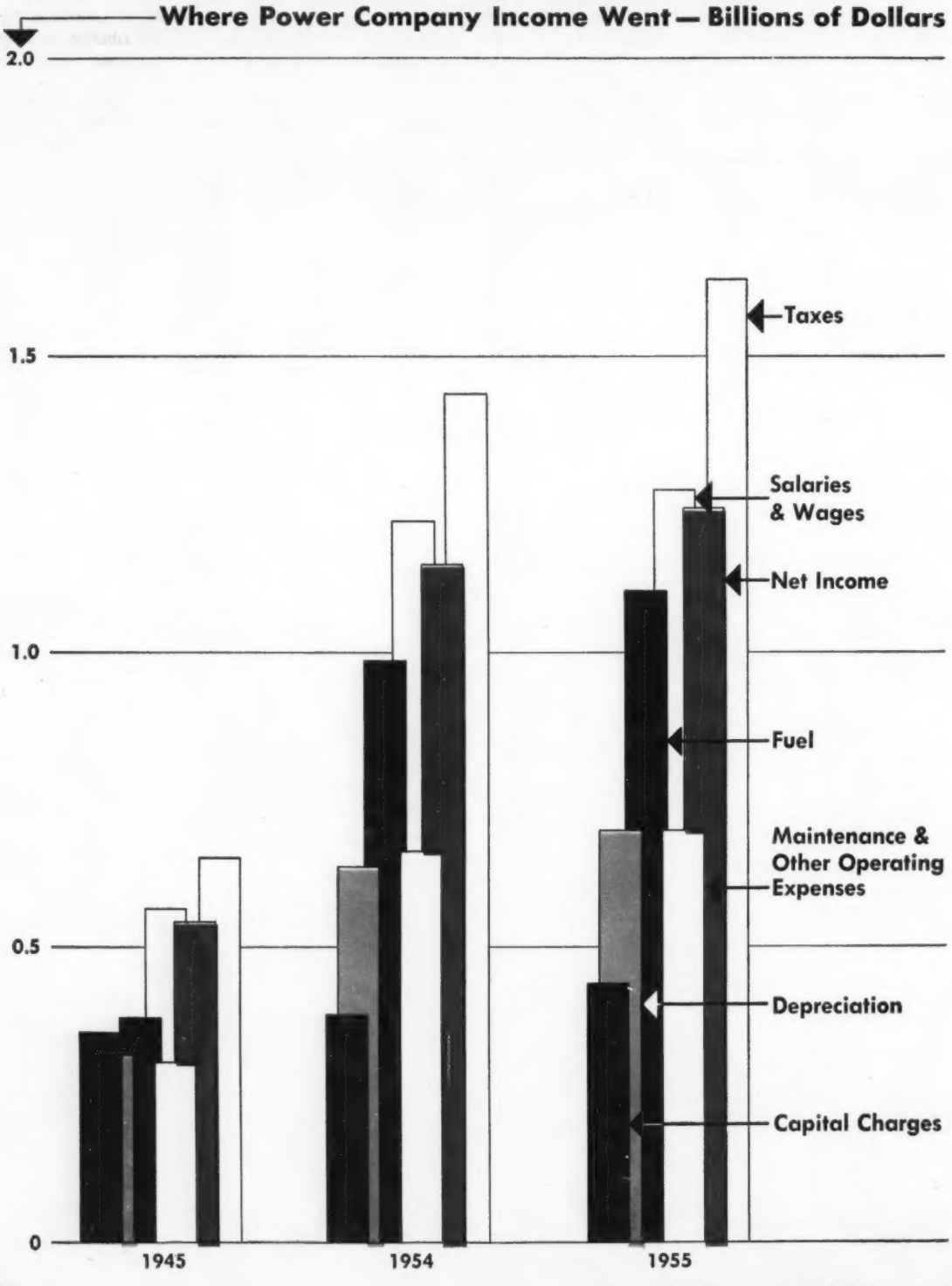
Transmission plant expenditures are the next biggest item in the budget. Over $115 million is scheduled for 1956—a gain of 32% over last year. Distribution facilities will benefit by $108 million, a 19% increase.

	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon & N.W.T.
Electric Plant Construction—Thousands of Dollars						
Fuel 1955	200	1,451	5,212	6,773	2,621	40
1956	3,225	12,000	8,925	6,636	2,100	100
Hydro 1955	60,408	5,808	...	3,362	20,307	...
1956	140,416	...	...	1,471	39,257	...
Transmission 1955	25,706	3,313	2,299	3,360	16,496	...
1956	27,742	3,188	2,981	4,968	33,980	...
Distribution 1955	37,006	5,238	2,604	5,569	14,168	3
1956	39,805	5,850	3,882	5,779	18,076	25
Miscellaneous 1955	4,159	1,350	7,372	851	3,973	5
1956	4,336	1,839	8,091	1,294	6,992	5
Total 1955	**127,479**	**17,160**	**17,487**	**19,915**	**57,565**	**48**
1956	**215,524**	**22,877**	**23,879**	**20,148**	**100,405**	**130**
Maintenance—Thousands of Dollars						
1955	25,076	1,882	415	5,314	3,869	15
1956	28,499	1,917	472	6,278	4,455	20
Line & Substation Construction—Thousands of Dollars						
Transmission Line						
66 kv & up 1955	6,666	761	1,122	1,341	12,399	...
1956	6,459	142	1,428	2,532	10,997	...
22-65.9 kv 1955	3,850	795	680	158	419	...
1956	3,527	1,044	760	293	1,497	...
Underground						
Transmission 1955	1,413	...	126	...	3	...
1956	4,619	...	160	...	4,163	...
Distribution 1955	1,120	...	...	758	628	...
1956	947	...	...	688	987	...
Primary Distribution Line						
Total 1955	3,296	3,424	7,378	4,753	4,373	2
1956	3,022	4,041	7,491	3,969	4,082	20
Rural 1955	2,914	933	5,068	3,192	2,694	2
1956	2,552	731	5,191	2,783	2,298	20
Substations 1955	29,229	2,516	439	1,462	2,514	...
1956	29,504	4,518	495	2,282	13,259	...
Line & Substation Construction						
Transmission Line—Circuit Miles						
66 kv & up 1955	196	111	191	177	211	...
1956	214	10	245	272	341	...
22-65.9 kv 1955	99	135	330	73	15	...
1956	114	135	400	116	56	...
Underground—Cable Miles						
Transmission 1955	10	...	13	...	1	...
1956	23	...	10	...	17	...
Distribution 1955	97	...	...	13	20	...
1956	81	...	...	12	31	...
Primary Distribution—Pole Miles						
Total 1955	1,609	2,109	7,476	3,470	835	1
1956	1,452	2,996	7,692	3,036	722	5
Rural 1955	1,476	599	7,186	3,360	596	1
1956	1,303	569	7,405	2,902	486	5
Substations—Thousands of kva						
1955	1,981	136	107	128	226	...
1956	1,885	143	99	319	1,911	...

FINANCIAL

Revenues, Net Income Hit Highs

Year saw investor-owned companies take in $6.9 billion for electric service and net income increased to $1.25 billion. Security sales topped $1.5 billion



While electric revenues of investor-owned electric companies went to a new high of over $6.9 billion in 1955, net income hit a record $1.25 billion. The amount transferred to surplus was $300 million.

Gross utility plant totaled $33.8 billion of which $30.5 billion was invested in electric plant at the year end.

Security sales by electric companies amounted to over $1.5 billion in 1955 of which $1.4 billion was "new money."

Yields on all quality bonds were up sharply during the year. Preferred stock yields held in a rather narrow range. Common stock yields had varied fluctuations.

In electric revenues all classifications showed moderate increases with industrial sales leading the way with 15% increase over 1954. Residential service was up 9%, followed closely by commercial sales which were up 8%.

All operating expenses showed increases with the largest being in fuel expense, up $111 million. This was due principally to fuel kwhr production being up 19.2% in 1955 over the previous year. Salaries continued to be the second largest expense, hitting a record high of $1.27 billion.

Depreciation charges were higher as the companies added new plants during the year. Such charges amounted to $701 million, an increase of $67 million, or 10.6% over the previous year.

Taxes still held first position as the largest expense in the statement of income. For 1955 they amounted to $1.6 billion, up 13.4% over 1954.

Net income amounted to $1.25 billion as compared with the former high of $1.15 billion in 1954.

Dividends continued to increase in 1955. They amounted to $946 million of which $795 million were common and $151 million preferred. The increase in common dividends during the year was due principally to companies paying extras or raising their dividend rate. Another factor was the larger number of shares outstanding.

Balance transferred to surplus totaled $300 million as against $285 million in 1954. This is a 5.3% increase.

Class A&B electric companies reporting to the Federal Power Commission had assets estimated at $31.2 billion at the end of 1955 as compared with $29.1 billion for 1954.

Composite Year End Balance Sheet — Millions of Dollars

Class A & B Electric Utility Companies

	1955*	1954	1953	1952
Assets				
Electric Plant and Adjustments	30,500	28,085	25,597	22,967
Other Utility Plant and Adjustments	3,300	3,162	3,049	2,764
Total Utility Plant	33,800	31,247	28,646	25,731
Reserves for Depreciation and Amortization of Utility Plant	6,400	5,906	5,499	5,105
Total Utility Plant Less Reserves	27,400	25,341	23,147	20,626
Investment and Fund Accounts	1,025	1,009	912	1,255
Current and Accrued Assets	2,500	2,438	2,377	2,443
Deferred Debits	200	187	179	179
Capital Stock Discount and Expenses	75	62	56	49
Reacquired Securities	15	17	27	29
Total Assets	**31,215**	**29,054**	**26,698**	**24,581**
Liabilities				
Capital Stock				
Preferred	3,500	3,281	3,084	2,897
Common	7,000	6,644	6,226	5,867
Premium on Capital Stock	800	710	605	465
Total Capital Stock	11,300	10,635	9,915	9,229
Long Term Debt				
Bonds	13,950	12,906	11,630	10,369
Other	400	416	410	440
Total Long Term Debt	14,350	13,322	12,040	10,809
Current and Accrued Liabilities	2,325	2,255	2,228	2,090
Reserves (except those deducted above)	200	144	93	79
Deferred Credits	175	141	132	128
Contributions in Aid of Construction	115	96	87	78
Surplus				
Earned	2,425	2,135	1,868	1,645
Capital	325	326	335	523
Total Surplus	2,750	2,461	2,203	2,168
Total Liabilities	**31,215**	**29,054**	**26,698**	**24,581**
Balance Sheet Ratios				
Reserve for Depreciation Percent of Utility Plant	18.9	18.9	19.2	19.8
Current Assets Times Current Liabilities	1.08	1.08	1.07	1.17
Long Term Debt				
Percent of Gross Utility Plant	42.5	42.6	52.0	42.0
Percent of Net Utility Plant	52.4	52.6	52.0	52.4

Source: Federal Power Commission. *1955 estimated by "Electrical World."

Security Sales by Electric Companies — Thousands of Dollars

	Bonds, Debentures, etc.		Stocks,		Distribution of Security Sales		
	Public Investors	Institutional Investors	Common and Preferred	Total Financing	New Capital	Refunding	Total Issues
1939	600,205	252,625	123,517	996,347	16,219	980,128	996,347
1940	660,716	188,976	139,767	989,459	92,376	897,083	989,459
1941	368,712	255,912	116,208	740,832	97,065	643,767	740,832
1942	226,800	99,688	29,766	356,254	92,666	263,588	356,254
1943	329,300	26,850	14,912	371,062	9,921	361,141	371,062
1944	851,743	103,950	62,535	1,018,228	15,587	1,002,641	1,018,228
1945	1,113,603	121,051	127,268	1,361,922	39,699	1,322,253	1,361,922
1946	633,966	64,040	384,441	1,082,447	172,846	909,601	1,082,447
1947	1,039,517	153,159	384,699	1,577,375	567,729	1,009,646	1,577,375
1948	996,641	156,525	297,460	1,450,626	1,314,456	136,170	1,450,626
1949	959,978	192,280	640,953	1,793,211	1,444,826	348,385	1,793,211
1950	838,108	278,389	591,340	1,707,837	1,300,040	407,797	1,707,837
1951	778,308	110,696	552,943	1,441,947	1,432,257	9,690	1,441,947
1952	929,167	145,860	630,652	1,705,679	1,693,514	12,165	1,705,679
1953	973,075	217,022	766,594	1,956,691	1,938,815	17,876	1,956,691
1954	1,379,885	184,063	784,469	2,348,417	1,761,154	587,263	2,348,417
1955	871,173	130,298	538,927	1,540,398	1,409,415	130,983	1,540,398

Source: Irving Trust Co.

Gross utility plant hit $33.8 billion as against $31.2 billion for the previous year.

Security sales by electric companies, compiled by the Irving Trust Co, amounted to over $1.5 billion, including over $1.4 billion for "new capital" in 1955. This compared with sales of $2.3 billion with $1.8 billion as "new capital" in 1954. Of the total $1.5 billion $1.4 billion was sold to public investors and $130 million to institutional investors.

All quality yields on electric company securities as reported by Reis & Chandler, Inc, showed upward trends during the year. This was largely due to the shortening of mortgage periods on housing; to a higher U. S. Treasury bill rate; to a boost in the commercial prime rate, and to an increase in the Federal Reserve Board rediscount rate.

First quality bond yields went from 2.89% at the end of 1954 to 3.12% at the end of 1955. The yields on the other two quality bonds showed similar trends.

Preferred stock yields held in a very narrow range during 1955. Common stock yields had wider fluctuations. First quality yields went to 4.46% at Dec. 31, 1955 versus 4.34% a year earlier. Second and third quality yields closed 1955 pretty near to 1954 levels.

Yields on Electric Utility Operating Company Securities

	Bonds			Preferred Stocks			Common Stocks		
Quarter	First Quality	Second Quality	Third Quality	First Quality	Second Quality	Third Quality	First Quality	Second Quality	Third Quality
1949									
I	2.70	2.78	2.92	4.00	4.27	4.67	5.78	6.69	8.08
II	2.69	2.75	2.88	3.98	4.26	4.66	5.94	6.96	8.14
III	2.61	2.65	2.77	3.88	4.15	4.54	5.55	6.47	7.51
IV	2.59	2.61	2.72	3.85	4.06	4.46	5.37	6.15	7.01
1950									
I	2.59	2.61	2.71	3.78	4.01	4.36	5.22	5.85	6.67
II	2.63	2.66	2.74	3.79	4.03	4.38	5.38	6.51	7.50
III	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.25
IV	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
1951									
I	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
II	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.37
III	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
IV	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
1952									
I	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47
II	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
III	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
IV	2.99	3.03	3.14	4.06	4.22	4.59	4.98	5.33	5.62
1953									
I	3.15	3.23	3.39	4.16	4.41	4.66	4.95	5.24	5.50
II	3.34	3.46	3.64	4.47	4.70	4.88	5.52	5.93	6.10
III	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.97	6.01
IV	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51
1954									
I	2.82	2.87	3.14	3.88	4.09	4.42	4.83	5.19	5.42
II	2.90	2.96	3.19	4.03	4.14	4.48	4.72	5.04	5.45
III	2.88	2.90	3.10	3.89	3.99	4.38	4.50	4.80	5.19
IV	2.89	2.92	3.10	3.93	4.04	4.37	4.34	4.75	5.16
1955									
I	2.99	3.02	3.18	3.95	4.09	4.39	4.33	4.64	4.93
II	3.03	3.09	3.21	3.97	4.06	4.37	4.37	4.52	4.74
III	3.11	3.15	3.32	3.98	4.11	4.39	4.31	4.57	4.79
IV	3.12	3.16	3.31	3.98	4.08	4.39	4.46	4.77	5.18

Source: Reis & Chandler, Inc.

REGULATION

Rate Increases Off During 1955

Electric Rate Increases

	GRANTED			PENDING			
		Known Increases			Known Pending		
	Grants	Grants	Dollars	As of Dec. 31	Applications	Applications	Dollars
1948.....	81	45	39,000,000	1948.....	18	11	22,000,000
1949.....	74	44	35,000,000	1949.....	7	5	16,000,000
1950.....	19	10	14,000,000	1950.....	21	14	20,200,000
1951.....	44	27	32,900,000	1951.....	44	32	75,700,000
1952.....	78	57	76,700,000	1952.....	36	21	44,400,000
1953.....	43	27	21,000,000	1953.....	27	22	62,700,000
1954.....	31	21	54,200,000	1954.....	23	16	37,600,000
1955*.....	29	19	25,300,000	1955*.....	8	5	6,200,000

*Preliminary

Electric companies received 29 rate increases in 1955 as against 31 the previous year. This was the smallest number since 1950 when 19 were recorded. Of the amounts revealed there were 19 grants in 1955 with $25.3 million as compared with 21 and $54.2 million in 1954.

Applications pending before state commissions totaled only eight with five asking for increases of $6.2 million.

The East North Central area had the largest number of known rate hikes with five totaling $7.8 million. Next was companies in Pacific area which received a total of four in-

Power Companies Income Statement — Millions of Dollars

	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955*
Total Electric Revenue	2,955	3,012	3,127	3,480	3,886	4,113	4,510	5,005	5,426	5,940	6,310	6,915
Operating Expenses	1,225	1,259	1,385	1,701	2,019	2,030	2,158	2,400	2,577	2,801	2,875	3,071
Depreciation	319	322	324	339	364	389	438	475	513	565	634	701
Total Expenses	1,544	1,581	1,709	2,040	2,383	2,419	2,596	2,875	3,090	3,366	3,509	3,772
Electric Operating Income before Taxes	1,411	1,431	1,418	1,440	1,503	1,694	1,914	2,130	2,336	2,574	2,801	3,143
Taxes	677	652	644	664	712	794	948	1,150	1,224	1,339†	1,437†	1,631†
Electric Operating Income after Taxes	734	779	774	776	791	900	966	980	1,112	1,235	1,364	1,512
Other Income[1]	125	126	130	125	118	132	147	154	166	149	176	176
Gross Corporate Income	859	905	904	901	909	1,032	1,113	1,134	1,278	1,384	1,540	1,688
Capital Charges[2]	342	360	258	245	243	267	282	311	322	343	389	442
Net Income	517	545	646	656	666	765	831	823	956	1,041	1,151	1,246
Dividends	406	415	466	500	499	566	626	658	732	788	866	946
Surplus	111	130	180	156	167	199	205	165	224	253	285	300

Source: Federal Power Commission & Edison Electric Institute. *Estimated. [1]Includes revenues of gas, water, and steam departments and interest on securities held. [2]Includes amortization and interest on long term debt. †Includes Federal Income Tax deferment arising from amortization of emergency facilities.

Distribution of the Electric Revenue Dollar — Percent

	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955*
Fuel	13.7	12.7	13.7	17.2	20.0	17.2	16.8	17.2	16.9	17.1	15.6	15.9
Salaries and Wages	17.4	18.1	20.2	21.2	21.2	21.1	20.7	20.5	20.0	19.6	19.4	18.4
Maintenance and Other Operating Expenses	10.4	11.0	10.5	10.5	10.8	11.1	10.4	10.3	10.5	10.5	10.5	10.1
Operating Ratio	41.5	41.8	44.4	48.9	52.0	49.4	47.9	48.0	47.4	47.2	45.5	44.4
Depreciation	10.8	10.7	10.4	9.7	9.4	9.5	9.7	9.5	9.5	9.5	10.0	10.1
Taxes	22.9	21.6	20.6	19.1	18.3	19.3	21.0	23.0	22.6	22.5	22.8	23.6
Electric Operating Income Before Taxes	47.7	47.5	45.4	41.4	38.7	41.2	42.4	42.6	43.1	43.3	44.4	45.5
Electric Operating Income After Taxes	24.8	25.9	24.8	22.3	20.4	21.9	21.4	19.6	20.5	20.8	21.6	21.9

Source: Edison Electric Institute *Estimated

with Only 8 Pending Applications

creases, totaling over $5.8 million.

Companies in East South Central and West South Central areas received no rate increases. However in the West South Central area there are two companies which have applications before the state commissions asking for increases totaling $4.9 million a year.

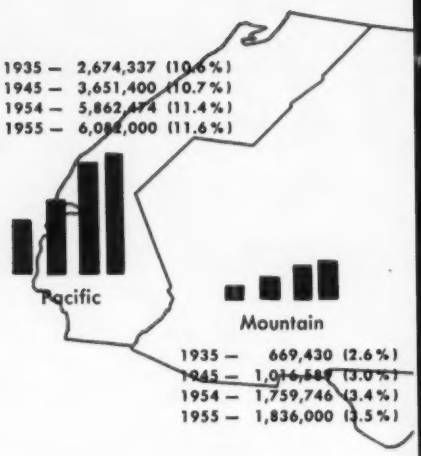
The largest increase was received by the San Diego Gas & Electric Co. It amounted to $4.3 million a year. This was followed by Cleveland Electric Illuminating Co with $4.2 million and Kansas City Power & Light Co and Potomac Electric Power Co with an estimated $4 million each.

Electric Rate Increases — 1955*

	GRANTED			PENDING		
		Known Increases			Known Pending	
	Grants	Grants	Dollars	Applications	Applications	Dollars
New England	3	2	1,400,000	1	1	300,000
Middle Atlantic	1	1	500,000	1	...	.....
East North Central	8	5	7,800,000	2	1	100,000
West North Central	5	2	4,200,000	...	...	.....
South Atlantic	4	2	3,900,000	...	...	.....
East South Central	...	...	.....	...	...	.....
West South Central	...	...	.....	2	2	4,900,000
Mountain	4	3	1,700,000	2	1	900,000
Pacific	4	4	5,800,000	...	...	.....
Total	**29**	**19**	**25,300,000**	**8**	**5**	**6,200,000**

*Preliminary

53 Million Customers Served During 1955

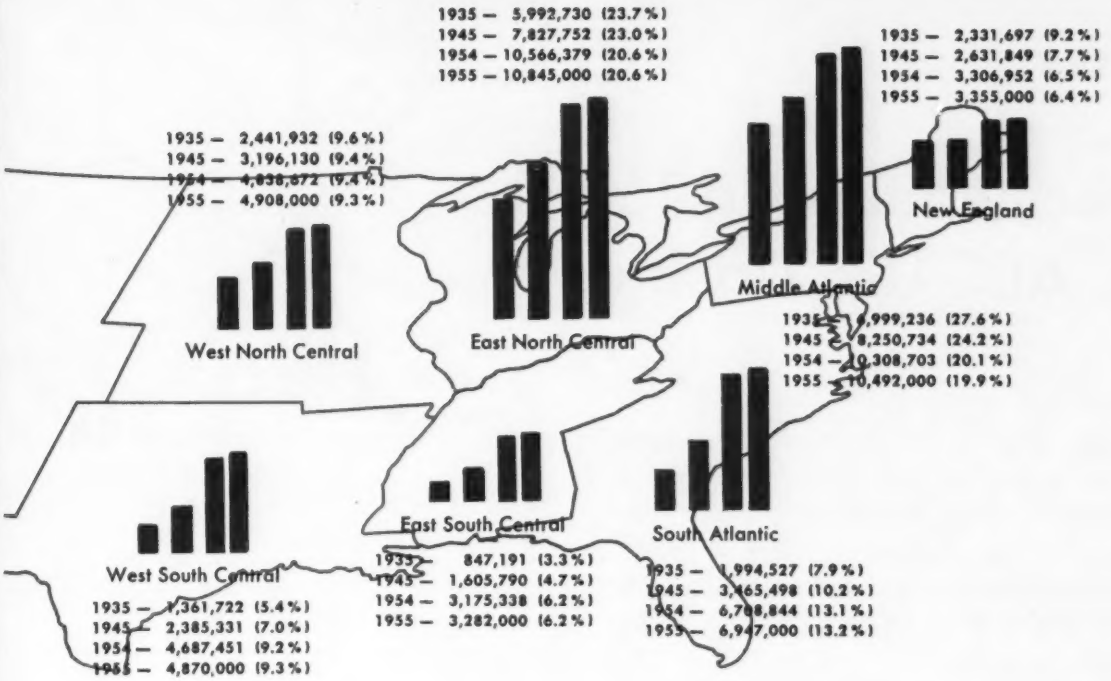


Electric utilities added 1.4 million new customers in 1955 bringing the total to 52,617,000. This increase was about in line with that of the past five years. Of this increase 1.3 million were residential customers. This brought the number of residential customers to 44.5 million, 84.5% of the total.

The increase in residential customers closely paralleled new home construction which reached 1.3 million units during the year.

Customers

	Residential			Rural*			Small Light & Power		
	Customers	% Total	Annual Change	Customers	% Total	Annual Change	Customers	% Total	Annual Change
1939....	23,965,035	82.3	853,273 (3.7%)	634,249	2.2	108,011 (20.5%)	4,215,254	14.5	87,897 (2.1%)
1940....	24,951,906	82.6	986,871 (4.1%)	685,812	2.3	51,563 (8.1%)	4,260,255	14.1	45,001 (1.1%)
1941....	26,025,513	82.3	1,073,607 (4.3%)	986,719	3.1	300,907 (43.9%)	4,299,976	13.6	39,721 (0.9%)
1942....	26,620,456	82.6	594,943 (2.3%)	1,095,512	3.4	108,793 (11.0%)	4,219,457	13.1	—80,519 (1.9%)
1943....	26,872,639	82.9	252,183 (0.9%)	1,088,698	3.4	—6,814 (0.6%)	4,168,245	12.8	—51,212 (1.2%)
1944....	27,371,260	82.8	498,621 (1.9%)	1,144,241	3.5	55,543 (5.1%)	4,263,395	12.9	95,150 (2.3%)
1945....	28,116,998	82.6	745,738 (2.7%)	1,234,441	3.6	90,200 (7.9%)	4,398,184	12.9	134,789 (3.2%)
1946....	29,769,107	82.3	1,652,109 (5.9%)	1,381,291	3.8	146,850 (11.9%)	4,692,850	13.0	294,666 (6.7%)
1947....	31,621,959	82.2	1,852,852 (6.2%)	1,522,136	4.0	140,845 (10.2%)	4,960,895	12.9	268,045 (5.7%)
1948....	33,549,396	82.4	1,927,437 (6.1%)	1,694,579	4.1	172,443 (11.3%)	5,131,730	12.6	170,835 (3.4%)
1949....	35,375,366	82.6	1,825,970 (5.4%)	1,804,415	4.2	109,836 (6.5%)	5,290,768	12.3	159,038 (3.1%)
1950....	37,532,549	83.4	2,157,183 (6.1%)	1,596,146	3.5	—208,269 (11.5%)	5,466,181	12.2	175,413 (3.3%)
1951....	39,224,621	83.8	1,692,072 (4.5%)	1,658,728	3.5	62,582 (3.9%)	5,528,117	11.8	61,936 (1.1%)
1952....	40,738,718	84.1	1,514,097 (3.9%)	1,663,201	3.4	4,473 (0.3%)	5,634,130	11.6	106,013 (1.9%)
1953....	41,981,633	84.1	1,242,915 (3.1%)	1,621,810	3.3	—41,391 (2.5%)	5,863,210	11.7	229,080 (4.1%)
1954....	43,139,998	84.2	1,158,365 (2.8%)	1,637,535	3.2	15,725 (1.0%)	5,991,586	11.7	128,376 (2.2%)
1955‡...	44,450,000	84.5	1,310,002 (3.0%)	1,656,500	3.1	18,965 (1.2%)	6,053,000	11.5	61,414 (1.0%)



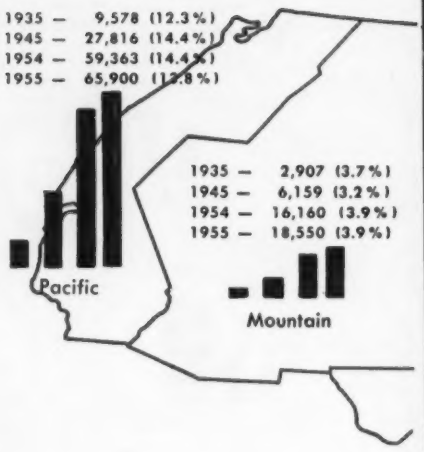
Customers and % Total U.S.

Source: Edison Electric Institute, 1955 estimated. All bars from left to right: 1935, 1945, 1954, 1955

	Large Light & Power			Other Classifications			Total	
	Customers	% Total	Annual Change	Customers	% Total	Annual Change	Customers	Annual Change
1939....	184,299	0.6	—7,423 (3.9%)	106,469	0.4	—162 (1.5%)	29,105,306	1,041,596 (3.7%)
1940....	177,904	0.6	—6,394 (3.5%)	115,123	0.4	8,654 (8.1%)	30,191,001	1,085,695 (3.7%)
1941....	172,677	0.6	—5,228 (2.9%)	122,486	0.4	7,363 (6.4%)	31,607,371	1,416,370 (4.7%)
1942....	149,928	0.5	—22,749 (13.2%)	125,087	0.4	2,601 (2.1%)	32,210,440	603,069 (1.9%)
1943....	146,593	0.5	—3,335 (2.2%)	120,125	0.4	—4,962 (4.0%)	32,396,300	185,860 (0.6%)
1944....	151,652	0.4	5,059 (3.5%)	117,844	0.4	—2,281 (1.9%)	33,048,392	652,092 (2.0%)
1945....	162,338	0.5	10,686 (7.0%)	119,112	0.4	1,268 (1.1%)	34,031,073	982,681 (3.0%)
1946....	174,662	0.5	12,324 (7.6%)	122,381	0.3	3,269 (2.7%)	36,140,291	2,109,218 (6.2%)
1947....	191,363	0.5	16,701 (9.6%)	135,597	0.4	13,216 (10.8%)	38,431,950	2,291,659 (6.3%)
1948....	204,230	0.5	12,867 (6.7%)	142,053	0.3	6,456 (4.8%)	40,721,988	2,290,038 (6.0%)
1949....	232,125	0.5	27,895 (13.7%)	148,107	0.3	6,054 (4.3%)	42,850,781	2,128,793 (5.2%)
1950....	234,728	0.5	2,603 (1.1%)	156,690	0.3	8,583 (5.8%)	44,986,294	2,135,513 (5.0%)
1951....	247,532	0.5	12,804 (5.5%)	162,881	0.3	6,191 (4.0%)	46,821,879	1,835,585 (4.1%)
1952....	256,294	0.5	8,762 (3.5%)	158,228	0.3	—4,653 (2.9%)	48,450,571	1,628,692 (3.5%)
1953....	271,947	0.5	15,653 (6.1%)	160,465	0.3	2,237 (1.4%)	49,899,065	1,448,494 (3.0%)
1954....	280,819	0.5	8,872 (3.3%)	164,621	0.3	4,156 (2.6%)	51,214,559	1,315,494 (2.6%)
1955‡...	288,500	0.5	7,681 (2.7%)	169,000	0.3	4,379 (2.7%)	52,617,000	1,402,441 (2.7%)

Source: Edison Electric Institute. * Customers served under distinctly rural rates. ‡ Estimated.

Energy Sales Up 16.6% As AEC Use Doubles

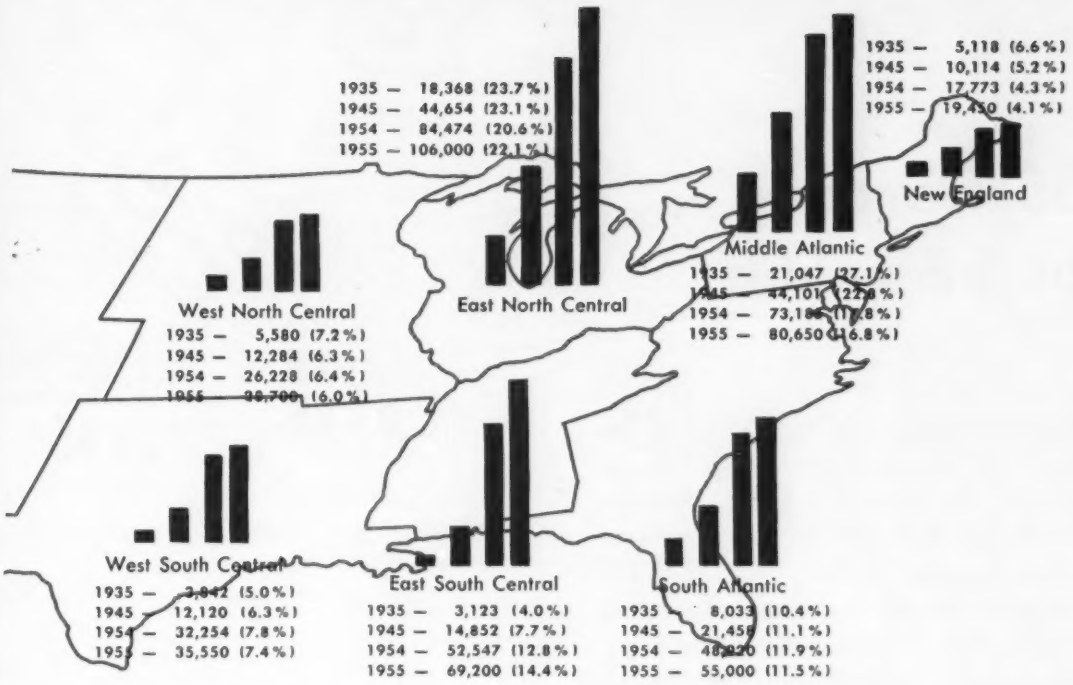


Energy sales to Atomic Energy Commission projects doubled in 1955. This, together with substantial increases in sales to residential customers (11.1%), commercial customers (9.7%) and industrial customers, other than AEC, (13.6%) pushed total sales up 68 billion kwhr—a 16.6% increase over 1954.

AEC purchases totalling an estimated 47 billion kwhr accounted for nearly 10% of total energy sales.

Sales of Electric Energy — Millions of Kwhr

	Residential			Rural*			Small Light & Power		
	Sales	% Total	Annual Change	Sales	% Total	Annual Change	Sales	% Total	Annual Change
1939.....	21,084	19.9	1,713 (8.8%)	1,881	1.7	304 (19.3%)	20,722	19.6	1,585 (8.3%)
1940.....	23,317	19.7	2,233 (10.6%)	1,991	1.7	110 (5.8%)	22,373	18.8	1,651 (8.0%)
1941.....	25,124	17.9	1,807 (7.7%)	2,352	1.7	361 (18.1%)	24,628	17.6	2,255 (10.1%)
1942.....	26,937	16.9	1,813 (7.2%)	2,890	1.8	538 (22.9%)	27,233	17.1	2,605 (10.6%)
1943.....	28,621	15.4	1,684 (6.3%)	2,996	1.6	106 (3.7%)	28,192	15.2	959 (3.5%)
1944.....	31,266	15.7	2,645 (9.2%)	3,373	1.7	377 (12.6%)	29,837	15.1	1,645 (5.8%)
1945.....	34,184	17.7	2,918 (9.3%)	3,669	1.9	296 (8.8%)	30,438	15.7	601 (2.0%)
1946.....	38,571	20.2	4,387 (12.8%)	4,431	2.3	762 (20.8%)	33,016	17.3	2,578 (8.5%)
1947.....	44,171	20.3	5,600 (14.5%)	5,551	2.5	1,120 (25.3%)	38,379	17.6	5,363 (16.2%)
1948.....	50,978	21.2	6,807 (15.4%)	6,327	2.6	776 (14.0%)	43,193	17.9	4,814 (12.5%)
1949.....	58,139	23.4	7,161 (14.0%)	7,384	3.0	1,057 (16.7%)	46,262	18.6	3,069 (7.1%)
1950.....	67,030	23.9	8,891 (15.3%)	7,400	2.6	16 (0.2%)	50,446	18.0	4,184 (9.0%)
1951.....	77,024	24.2	9,994 (14.9%)	8,479	2.7	1,079 (14.6%)	57,278	18.0	6,832 (13.5%)
1952.....	86,780	25.3	9,756 (12.7%)	8,536	2.5	57 (0.7%)	62,080	18.1	4,802 (8.4%)
1953.....	97,063	25.3	10,283 (11.8%)	9,613	2.5	1,077 (12.6%)	69,208	18.0	7,128 (11.5%)
1954.....	108,465	26.4	11,402 (11.7%)	10,176	2.5	563 (5.9%)	73,373	17.9	4,165 (6.0%)
1955‡.....	120,500	25.2	12,035 (11.1%)	10,600	2.2	424 (4.2%)	80,500	16.8	7,127 (9.7%)



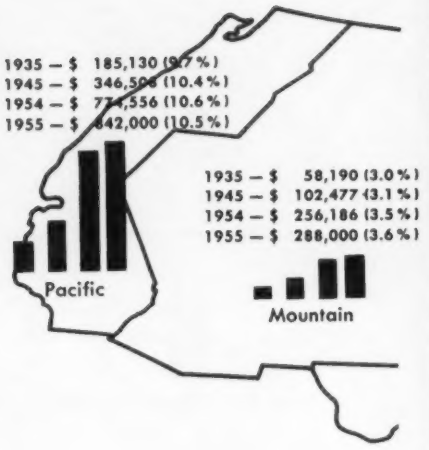
Sales of Electric Energy — Millions of Kwhr and % Total U. S.

Source: Edison Electric Institute, 1955 estimated. All bars from left to right: 1935, 1945, 1954, 1955

	Large Light & Power			Other Classifications			Total	
	Sales	% Total	Annual Change	Sales	% Total	Annual Change	Sales	Annual Change
1939.....	51,108	48.3	7,968 (18.5%)	10,972	10.4	466 (4.4%)	105,767	12,036 (12.8%)
1940.....	59,557	50.2	8,449 (16.5%)	11,405	9.6	433 (3.9%)	118,643	12,876 (12.2%)
1941.....	76,061	54.3	16,504 (27.7%)	11,895	8.5	490 (4.3%)	140,060	21,957 (18.5%)
1942.....	88,378	55.4	12,317 (16.2%)	13,969	8.8	2,074 (17.4%)	159,407	18,807 (13.4%)
1943.....	106,657	57.4	18,279 (20.7%)	19,423	10.4	5,454 (3.9%)	185,889	26,482 (16.6%)
1944.....	115,187	58.1	8,530 (8.0%)	18,497	9.3	—926 (4.8%)	198,160	12,271 (6.6%)
1945.....	107,490	55.5	—7,697 (6.7%)	17,777	9.2	—720 (3.9%)	193,558	—4,602 (2.3%)
1946.....	98,885	51.8	—8,605 (8.0%)	15,892	8.3	—1,885 (10.6%)	190,795	—2,763 (1.4%)
1947.....	113,523	52.2	14,638 (14.8%)	15,957	7.3	65 (0.4%)	217,581	26,786 (14.0%)
1948.....	124,088	51.6	10,565 (9.3%)	16,154	6.7	197 (1.2%)	240,740	23,159 (10.6%)
1949.....	120,766	48.6	—3,322 (2.7%)	15,991	6.4	—163 (1.0%)	248,542	7,802 (3.2%)
1950.....	139,065	49.5	18,299 (15.2%)	16,598	5.9	607 (3.8%)	280,539	31,997 (12.9%)
1951.....	157,827	49.6	18,762 (13.5%)	17,560	5.5	962 (5.8%)	318,168	37,629 (13.4%)
1952.....	167,358	48.9	9,531 (6.0%)	17,770	5.2	210 (1.2%)	342,524	24,356 (7.7%)
1953.....	190,010	49.5	22,652 (13.5%)	18,350	4.8	580 (3.3%)	384,244	41,720 (12.2%)
1954.....	200,155	48.7	10,145 (5.3%)	18,735	4.6	385 (2.1%)	410,904	26,660 (6.9%)
1955‡.....	247,800	51.7	47,645 (23.8%)	19,600	4.1	865 (4.6%)	479,000	68,096 (16.6%)

Source: Edison Electric Institute. *Sales on distinct rural rates. ‡Estimated.

1955 Revenue Tops $8 Billion

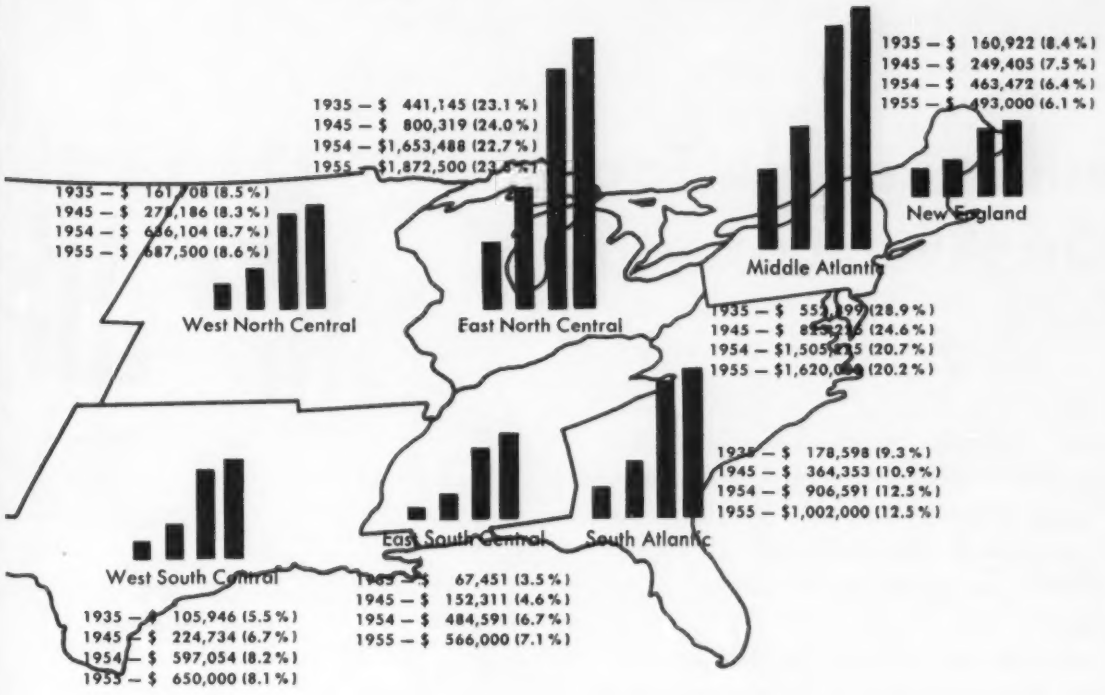


Revenue from energy sales in 1955 topped $8 billion for a 10.2% increase over 1954. This increase amounted to nearly $¾ billion. Revenue derived from sales to large light and power customers alone increased 14.9%. This nearly $⅓ billion increase brought total large light and power revenue to $2.3 billion—28% of the total.

Second largest increase was residential. Amounting to over $¼ billion, 9.0%, this increase brought residential to $3.2 billion—40% of the total.

Revenue from Energy Sales — Thousands of Dollars

	Residential			Rural*			Small Light & Power		
	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change
1939.....	843,158	36.8	40,626 (5.1%)	45,484	2.0	6,556 (16.8%)	660,683	28.9	28,592 (4.5%)
1940.....	895,951	36.7	52,793 (6.3%)	49,473	2.0	3,989 (8.8%)	689,253	28.2	28,570 (4.3%)
1941.....	938,229	35.2	42,278 (4.7%)	64,396	2.4	14,923 (30.2%)	725,117	27.2	35,864 (5.2%)
1942.....	990,185	34.7	51,956 (5.5%)	75,027	2.6	10,631 (16.5%)	767,279	26.9	42,162 (5.8%)
1943.....	1,029,260	33.4	39,075 (3.9%)	76,617	2.5	1,590 (2.1%)	773,678	25.2	6,399 (0.8%)
1944.....	1,097,726	33.5	68,466 (6.7%)	82,842	2.5	6,225 (8.1%)	817,355	24.9	43,677 (5.6%)
1945.....	1,167,356	34.9	69,630 (6.3%)	90,345	2.7	7,503 (9.1%)	850,213	25.4	32,858 (4.0%)
1946.....	1,240,577	35.9	73,221 (6.3%)	104,876	3.0	14,531 (16.1%)	924,775	26.7	74,562 (8.8%)
1947.....	1,366,498	35.5	125,921 (10.2%)	123,749	3.2	18,873 (18.0%)	1,031,335	26.8	106,560 (11.5%)
1948.....	1,532,664	35.5	166,166 (12.2%)	140,648	3.3	16,899 (13.7%)	1,152,783	26.7	121,448 (11.8%)
1949.....	1,716,533	37.2	183,869 (12.0%)	160,855	3.5	20,207 (14.4%)	1,228,726	26.6	75,943 (6.6%)
1950.....	1,931,696	38.0	215,163 (12.5%)	157,611	3.1	—3,244 (2.0%)	1,333,755	26.2	105,029 (8.5%)
1951.....	2,165,010	38.3	233,314 (12.1%)	175,431	3.1	17,820 (11.3%)	1,462,262	25.9	128,507 (9.6%)
1952.....	2,400,889	39.1	235,879 (10.9%)	184,479	3.0	9,048 (5.2%)	1,584,219	25.8	121,957 (8.3%)
1953.....	2,659,303	39.1	258,414 (10.7%)	201,691	3.0	17,212 (9.3%)	1,747,572	25.7	163,353 (10.3%)
1954.....	2,920,196	40.1	260,893 (9.8%)	216,391	3.0	14,700 (7.3%)	1,846,634	25.4	99,062 (5.7%)
1955‡.....	3,184,000	39.7	263,804 (9.0%)	227,000	2.8	10,609 (4.9%)	2,000,000	24.9	153,366 (8.3%)



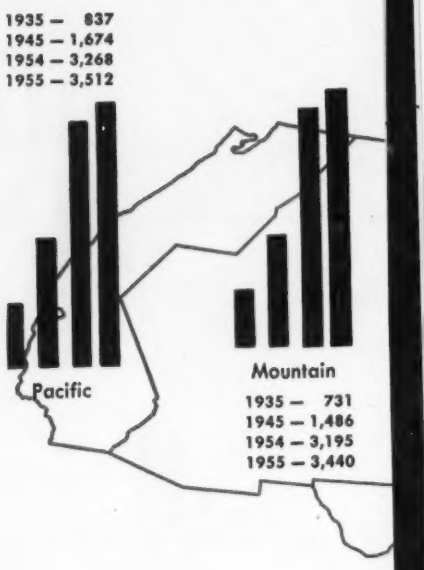
Revenue — Thousands of Dollars and % Total U. S.

Source: Edison Electric Institute, 1955 estimated. All bars from left to right: 1935, 1945, 1954, 1955

	Large Light & Power			Other Classifications			Total	
	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change	Revenue	Annual Change
1939.....	572,659	25.0	53,965 (10.4%)	167,599	7.3	3,264 (2.0%)	2,289,583	133,003 (6.2%)
1940.....	631,428	25.9	58,769 (10.3%)	174,112	7.1	6,513 (3.9%)	2,440,217	150,634 (6.6%)
1941.....	758,083	28.5	126,655 (20.1%)	179,232	6.7	5,120 (2.9%)	2,665,057	224,840 (9.2%)
1942.....	828,318	29.0	70,235 (9.3%)	195,034	6.8	15,802 (8.8%)	2,855,843	190,786 (7.2%)
1943.....	964,192	31.3	135,874 (16.4%)	233,896	7.6	38,862 (19.9%)	3,077,643	221,800 (7.8%)
1944.....	1,043,392	31.8	79,200 (8.2%)	235,436	7.2	1,450 (6.2%)	3,276,751	199,108 (6.5%)
1945.....	1,001,957	30.0	—41,435 (4.0%)	231,647	6.9	—3,789 (1.6%)	3,341,518	64,767 (2.0%)
1946.....	969,349	28.0	—32,608 (3.3%)	219,983	6.4	—11,664 (5.0%)	3,459,560	118,042 (3.5%)
1947.....	1,106,555	28.7	137,206 (14.1%)	224,628	5.8	4,645 (2.1%)	3,852,765	393,205 (11.4%)
1948.....	1,250,684	29.0	144,129 (13.0%)	236,534	5.5	11,906 (5.3%)	4,313,313	460,548 (12.0%)
1949.....	1,262,698	27.4	12,014 (1.0%)	245,257	5.3	8,723 (3.7%)	4,614,069	300,756 (7.0%)
1950.....	1,404,980	27.6	142,282 (11.3%)	258,423	5.1	13,166 (5.4%)	5,086,465	472,396 (10.2%)
1951.....	1,571,932	27.8	166,952 (11.9%)	273,037	4.8	14,614 (5.7%)	5,647,672	561,207 (11.0%)
1952.....	1,684,073	27.4	112,141 (7.1%)	283,612	4.6	10,575 (3.9%)	6,137,272	489,600 (8.7%)
1953.....	1,883,640	27.7	199,567 (11.9%)	301,454	4.4	17,842 (6.3%)	6,793,660	656,388 (10.7%)
1954.....	1,977,283	27.2	93,643 (5.0%)	316,763	4.4	15,309 (5.1%)	7,277,267	483,607 (7.1%)
1955‡.....	2,271,000	28.3	293,717 (14.9%)	339,000	4.2	22,237 (7.0%)	8,021,000	743,733 (10.2%)

Source: Edison Electric Institute. *Revenue from sales under distinctly rural rates. ‡Estimated.

Residential Use Tops 1954 Average by 8.1%

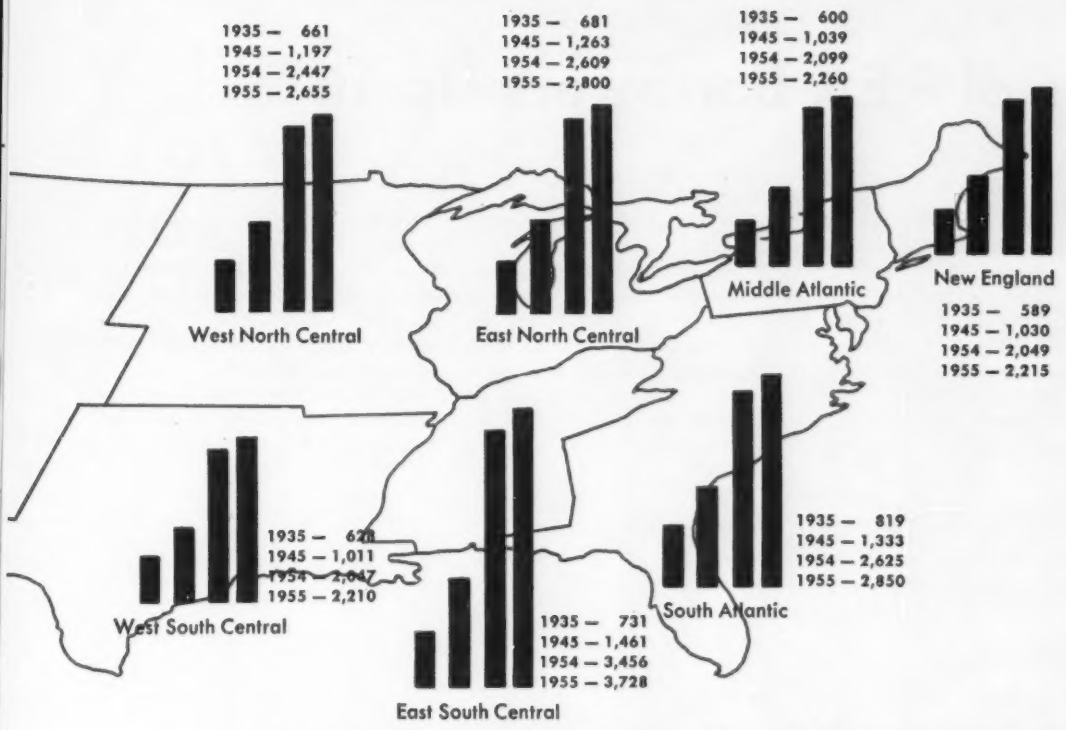


Average residential use climbed a record 206 kwhr in 1955 to 2,755 kwhr—an 8.1% increase. This increase in use, which led to a 1.9% decrease in the cost per kwhr, brought the average residential customers annual bill to $72.73, only a 6.1% increase.

The average cost per kwhr for total ultimate customers dropped 5.6% to 1.67¢, reflecting the low rates paid by the AEC and the increase in AEC use to nearly 10% of total sales.

Average Use and Bill Per Customer

	Residential				Small Light	
	Average Use		Average Bill		Average Use	
	Kwhr	Change	per Kwhr	Annual	Kwhr	Change
1939	897	44 (4.9%)	4.00¢	$35.88	4,968	300 (6.4%)
1940	952	55 (6.1%)	3.84¢	$36.56	5,280	312 (6.3%)
1941	986	34 (3.6%)	3.73¢	$36.78	5,754	474 (9.0%)
1942	1,022	36 (3.7%)	3.67¢	$37.51	6,354	600 (10.4%)
1943	1,070	48 (4.7%)	3.60¢	$38.52	6,722	368 (5.8%)
1944	1,151	81 (7.6%)	3.51¢	$40.40	7,080	358 (5.3%)
1945	1,229	78 (6.8%)	3.41¢	$41.97	7,062	—18 (0.3%)
1946	1,329	100 (8.1%)	3.22¢	$42.79	7,224	162 (2.3%)
1947	1,438	109 (8.2%)	3.09¢	$44.43	7,915	691 (9.6%)
1948	1,563	125 (8.7%)	3.01¢	$47.05	8,535	620 (7.8%)
1949	1,684	121 (7.7%)	2.95¢	$49.68	8,871	336 (3.9%)
1950	1,830	146 (8.7%)	2.88¢	$52.70	9,320	449 (5.1%)
1951	2,004	174 (9.5%)	2.81¢	$56.31	10,432	1,112 (11.9%)
1952	2,169	165 (8.2%)	2.77¢	$60.08	11,106	674 (6.5%)
1953	2,346	177 (8.2%)	2.74¢	$64.28	12,007	901 (8.1%)
1954	2,549	203 (8.7%)	2.69¢	$68.57	12,353	346 (2.9%)
1955*	2,755	206 (8.1%)	2.64¢	$72.73	13,325	972 (7.9%)



Use by the Average Residential Customer—Kwhr

Source: Edison Electric Institute, 1955 estimated. All bars from left to right: 1935, 1945, 1954, 1955

and Power Average Bill per Kwhr	Annual	Total Ultimate Customers Average Use Kwhr	Change	Average Bill per Kwhr	Annual	
3.19¢	$158	3,702	310 (9.1%)	2.16¢	$79.96	1939
3.08¢	$163	3,998	296 (8.0%)	2.06¢	$82.35	1940
2.94¢	$169	4,535	537 (13.4%)	1.90¢	$86.17	1941
2.82¢	$179	4,980	445 (9.8%)	1.79¢	$98.14	1942
2.74¢	$184	5,753	773 (15.5%)	1.66¢	$95.50	1943
2.74¢	$194	6,047	294 (5.1%)	1.65¢	$99.78	1944
2.79¢	$197	5,762	—285 (4.7%)	1.73¢	$99.68	1945
2.80¢	$202	5,422	—340 (5.9%)	1.81¢	$98.14	1946
2.69¢	$213	5,828	406 (7.5%)	1.77¢	$103.16	1947
2.67¢	$228	6,073	245 (4.2%)	1.79¢	$108.71	1948
2.66¢	$236	5,937	—136 (2.2%)	1.86¢	$110.43	1949
2.64¢	$246	6,377	440 (7.4%)	1.81¢	$115.42	1950
2.55¢	$266	6,922	545 (8.5%)	1.78¢	$123.21	1951
2.55¢	$283	7,183	261 (3.8%)	1.79¢	$128.58	1952
2.53¢	$304	7,815	632 (8.8%)	1.77¢	$138.33	1953
2.52¢	$311	8,127	312 (4.0%)	1.77¢	$143.85	1954
2.48¢	$330	9,225	1,098 (13.5%)	1.67¢	$154.00	.....1955*

Source: Edison Electric Institute. *Estimated

REA—FINANCED SYSTEMS

Sales of REA Borrowers Up 16%

Sales of electric energy by REA-financed power systems went up 16%, and the cost of power to consumers dropped 5% during 1955.

For the first time in the history of the 20-year-old REA program, the average cost of power to residential consumers, including farm and non-farm, dropped under 3¢ per kwhr. The average cost was 2.95¢ per kwhr. In 1954 this average was 3.09¢ and in 1953, 3.22¢.

Average annual consumption among the residential consumers went up from 2,676 kwhr to 2,928, and the average annual bill increased from $82.56 to $86.52—a 9% increase in consumption, yet only a 5% increase in average cost.

REA-financed systems sold an estimated 19 billion kwhr, an increase of about 16% over the 16.5 billion kwhr sold in 1954. Their generation of power was up 21% and their purchases of wholesale power up 13%. They paid $154 million for the power they distributed.

At the year's end there were 1,026 borrowers with systems in operation, serving 4,244,000 rural consumers.

Statistics of REA-Financed Systems

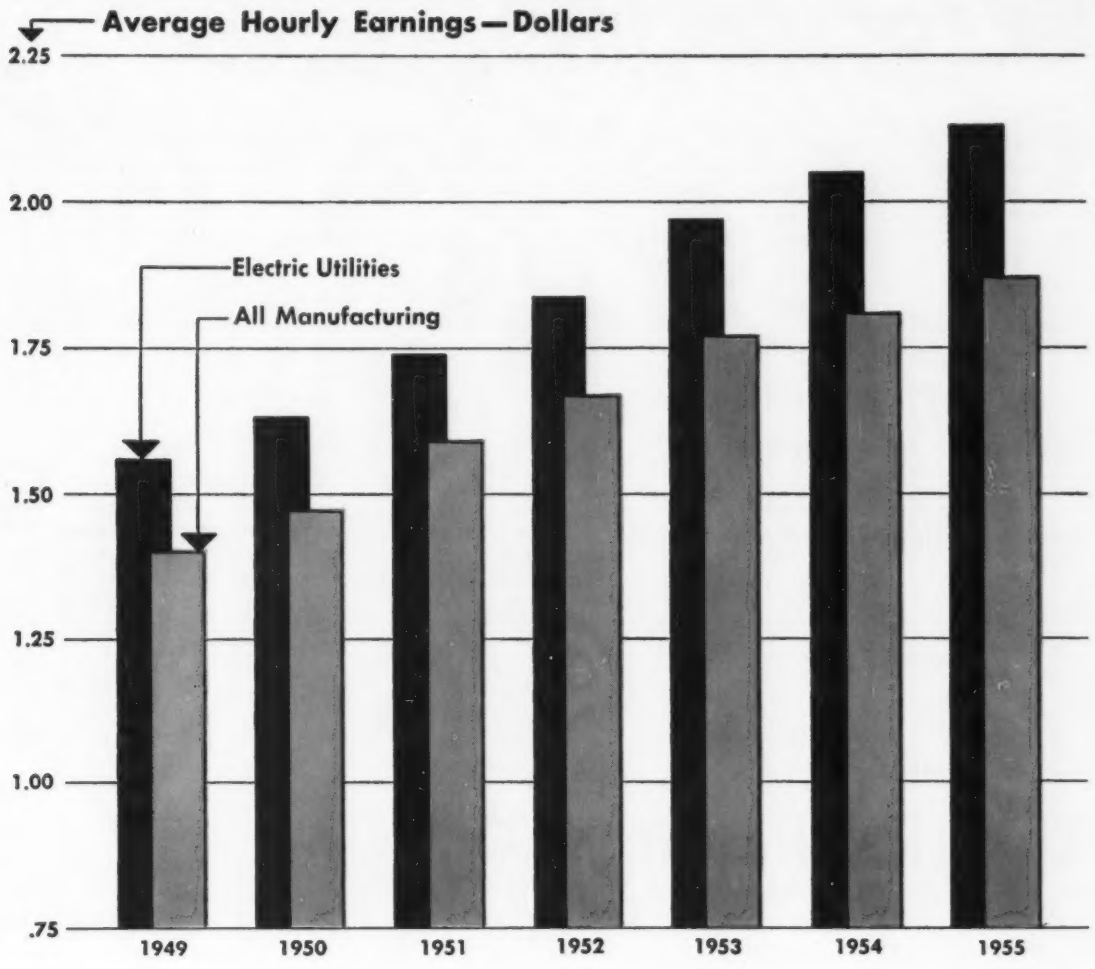
	1953	1954	1955[1]
CUMULATIVE YEAR-END DATA			
Total Loans Approved	$2,778,136,191	$2,946,228,477	$3,134,000,000
Distribution Lines	$2,251,886,542	$2,379,190,834	$2,516,000,000
Generation and Transmission	$ 505,289,886	$ 543,744,565	$ 590,000,000
Consumer Facilities	$ 20,959,763	$ 23,293,078	$ 28,000,000
Funds Advanced	$2,359,965,707	$2,524,105,716	$2,679,000,000
Systems in Operation	1,022	1,024	1,026
Miles of Line in Operation	1,297,264	1,332,937	1,359,000
Consumers Served[2]	4,024,826	4,174,346	4,244,000
Systems Generating Power During Year	89	86	79
Generating Plants—kw	678,304	822,325	880,000
ANNUAL DATA			
Energy Generated—kwhr	2,103,446,229	2,720,907,119	3,295,000,000
Energy Purchased—kwhr	13,737,813,667	16,129,367,014	18,289,000,000
Total System Input—kwhr	15,841,259,896	18,850,274,133	21,584,000,000
Energy Sold—kwhr	13,755,493,788	16,508,177,005	19,069,000,000
Operating Revenues	$ 362,977,101	$ 408,144,564	$ 453,400,000
Operating Deductions Totals	$ 296,653,728	$ 326,868,653	$ 353,700,000
Cost of Power[3]	$ 121,926,707	$ 138,236,950	$ 154,300,000
Distribution Expenses—Operations	$ 28,233,079	$ 30,426,367	$ 32,200,000
Distribution Expenses—Maintenance	$ 14,836,059	$ 16,395,166	$ 16,500,000
Consumers Accounting & Collecting	$ 13,569,097	$ 14,511,858	$ 15,300,000
Administration & General Expenses	$ 32,460,031	$ 34,319,823	$ 36,500,000
Other Operating Expenses	$ 4,433,827	$ 4,639,065	$ 5,100,000
Depreciation	$ 70,091,242	$ 75,776,005	$ 79,800,000
Amortization of Intangibles, etc.	$ 991,510	$ 1,149,030	$ 1,200,000
Taxes	$ 10,112,176	$ 11,414,389	$ 12,800,000
Utility Operating Margin	$ 66,323,373	$ 81,275,911	$ 99,700,000
Non-Operating Margin	$ 2,219,455	$ 3,280,170	$ 4,300,000
Interest on Long Term Debt	$ 38,060,539	$ 40,397,061	$ 42,600,000
Interest Charged to Construction Cr.	$ 832,398	$ 344,075	$ 900,000
Other Deductions	$ 485,873	$ 537,312	$ 500,000
Net Margin	$ 30,828,814	$ 43,965,783	$ 61,800,000
PAYMENTS TO GOVERNMENT—CUMULATIVE DATA			
Interest Due	$ 163,617,881	$ 192,699,770	$ 227,400,000
Interest Paid	$ 163,484,884	$ 192,599,755	$ 227,300,000
Principal Due	$ 243,739,286	$ 297,905,511	$ 359,100,000
Principal Paid	$ 307,495,236	$ 376,238,237	$ 452,700,000
Overdue Amounts—More than 30 days	$ 355,592	$ 307,340	$ 475,000
a. Interest	$ 36,659	$ 55,083	$ 35,000
b. Principal	$ 318,933	$ 252,257	$ 440,000
Advance Payments of Principal	$ 62,496,021	$ 78,647,457	$ 91,800,000

Source: Monthly Operating Reports of Rural Electrification Administration borrowers and records of the Rural Electrification Administration.

[1] Based on nine months actual data and one to three months estimated.

[2] Formerly called "Consumers Connected." The change is a result of a revised definition of a consumer as reported by REA borrowers, effective January 1, 1955. Figures are on the former basis for 1953 and 1954; and on the new basis for 1955. The change resulted in a downward adjustment in the national total of about 60,000, chiefly through elimination of idle services.

[3] Cost of Power includes cost of purchased power and prime costs involved in the production and transmission of generated energy.



Employment and Wages Continue to Set Record Highs

Average Wages of Electric Utility Employees

	Hourly Earnings	Weekly Earnings	Weekly Hours	Employees (thousands)
1949	$1.56	$64.91	41.5	236.4
1950	$1.63	$67.81	41.6	238.9
1951	$1.74	$72.91	41.9	240.4
1952	$1.84	$76.18	41.4	244.0
1953	$1.97	$81.56	41.4	248.2
1954	$2.05	$84.67	41.3	249.0
1955*	$2.13	$87.76	41.2	250.4

Source: Bureau of Labor Statistics. *Estimated

Employment and wages of electric utility companies hit a record high in 1955, according to estimated figures furnished by the U. S. Bureau of Labor Statistics.

The number of employees in the industry totalled 250,400 at the end of 1955 as compared with 249,000 in 1954. The average hourly earnings went to a record $2.13 an hour versus $2.05 a year earlier. Since 1950 when the average employee received $1.63 an hour, wages have increased by 50¢ an hour, or 30.7%.

For a 41.2-hour work week at $2.13 an hour, the average electric utility employee received a total of $87.76 a week in 1955. This compared with $1.63 an hour or $67.81 for a 41.6-hour work week in 1950.

The average employee in the electric utility industry received a 3.9%-wage increase in 1955.

PRODUCTION AND CAPACITY

Energy Production—Thousands of Kwhr

The Decade After World War II vs . . .

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955*	Growth During Decade
United States	**223,177,783**	**255,738,984**	**282,698,214**	**291,099,543**	**329,141,343**	**370,672,814**	**399,223,620**	**442,664,515**	**471,686,354**	**546,838,000**	**145%**
New England	12,307,316	13,345,558	14,340,799	14,275,119	16,211,090	17,490,135	18,536,886	20,082,316	20,367,718	22,493,000	83%
Middle Atlantic	47,349,127	53,201,063	57,432,338	56,932,537	63,372,026	70,027,551	73,029,805	78,319,526	78,952,982	86,256,000	82%
East North Central	50,068,828	58,878,762	65,141,392	66,253,043	75,348,736	84,391,209	88,896,311	98,331,103	103,053,780	125,534,000	151%
West North Central	13,187,243	15,033,119	16,250,127	17,486,390	19,236,924	21,170,029	22,578,709	24,960,972	27,532,829	30,501,000	131%
South Atlantic	28,550,786	32,266,053	36,088,537	36,972,827	43,603,622	49,754,088	55,294,665	60,711,395	62,955,691	71,520,000	150%
East South Central	16,485,964	18,672,715	21,242,351	21,823,891	24,605,839	27,958,557	32,230,471	39,364,441	48,730,172	66,749,000	305%
West South Central	13,068,797	15,340,396	17,793,394	19,429,028	22,515,028	26,996,721	30,562,614	34,165,911	37,216,734	40,609,000	211%
Mountain	11,658,655	12,881,050	14,807,916	15,443,778	16,496,769	17,626,300	22,618,080	21,828,710	23,030,227	24,353,000	109%
Pacific	30,501,067	36,120,268	39,601,360	42,482,930	47,751,309	55,258,224	55,476,079	64,900,141	69,846,221	78,823,000	158%

The Decade After World War I

	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	Growth During Decade
United States	**34,297,848**	**39,404,639**	**37,180,123**	**43,632,457**	**51,228,664**	**54,661,796**	**61,451,091**	**69,352,796**	**75,418,306**	**82,793,647**	**141%**
New England	2,351,452	2,604,591	2,483,991	2,939,210	3,423,931	3,515,302	4,013,073	4,331,230	4,689,220	5,160,477	119%
Middle Atlantic	9,190,471	10,699,743	9,583,976	11,397,053	13,613,668	14,424,958	16,312,477	18,567,561	19,719,514	20,651,669	125%
East North Central	8,089,380	9,396,766	8,645,181	10,262,971	12,025,561	13,200,737	15,191,962	17,147,937	18,426,510	20,636,856	155%
West North Central	2,392,364	2,736,405	2,835,251	3,189,761	3,585,029	3,543,207	3,823,375	4,157,769	4,520,568	4,818,199	101%
South Atlantic	3,369,651	3,641,216	3,854,625	4,571,193	5,403,331	5,664,700	5,979,265	6,850,423	7,770,096	9,107,046	170%
East South Central	1,161,083	1,336,825	1,195,457	1,473,096	1,807,645	1,978,731	2,517,689	2,977,595	3,337,244	3,270,077	182%
West South Central	912,303	1,125,063	1,215,991	1,345,652	1,562,903	1,791,881	2,077,051	2,517,892	3,273,205	4,025,087	341%
Mountain	2,206,814	2,521,098	1,799,218	2,337,831	2,777,767	2,896,074	3,057,291	3,363,521	3,457,053	3,842,938	74%
Pacific	4,624,330	5,342,932	5,566,433	6,115,690	7,028,829	7,646,206	8,478,908	9,438,868	10,224,896	11,281,298	144%

Source: Federal Power Commission. *Estimated.

Electrical Industry's Growth Paces Nation's Growth

During 1955, the end of the decade following World War II, electric utility production was nearly one and a half times as great as it was in 1946, the start of the decade. The 145% growth in the industry's kwhr production compares with an 85% growth in the nation's total output of goods and services (Gross National Product). And it compares with a 54% growth in industrial production.

Remarkable is the fact that the growth during the decade following World War II closely parallels the growth during the decade following World War I. From 1919 to 1928 production of electric energy increased 141%, from 1946 to 1955 it increased 145%. During 1955 production reached a level nearly seven times greater than that reached in 1928.

What does this rate of growth in production mean in terms of new capacity requirements? In 1946 the industry added new capacity at the rate of 394 Mw. This brought net additions, after retirements and adjustments, to 206 Mw. The following year saw construction of 2,147 Mw—over five times the 1946 level. In 1948 the level of additions doubled. By 1955, after an almost steady rise, the level of new capacity additions rose to nearly 12,000 Mw. (These figures are based on name plate ratings and are not directly comparable to the maximum rated capability data collected in Electrical World's 1955-56 survey).

In the ten years following World War II, electric utilities added 65,606 Mw of new capacity. That's 30% more than the total installed at the end of 1946. At that time electric utilities had 50,317 Mw in service.

Retirements during the last decade amounted to 2,746 Mw or about 4% of the new capacity additions.

Adjustments, shown in the table on the next page, are the result of reclassification of ownership between industrial and electric utility plants and rerating of turbines within the electric utility industry.

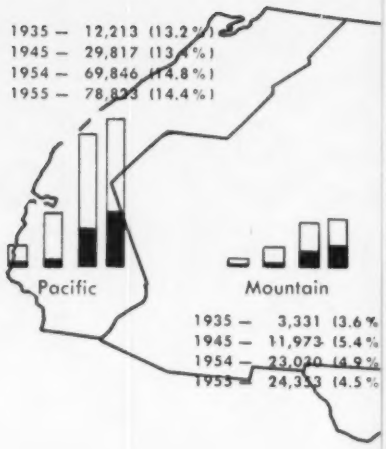
As might be expected, when considering any great length of time, growth of individual regions varied greatly. During the ten years following World War II, for example, the East South Central region increased its' production a whopping 305%. Growth in other regions was as low as 82%. At the start of the decade East North Central ranked first in production. Middle Atlantic followed, with Pacific third. At the close of the decade this order remained unchanged. Today these three regions account for 53% of the total.

Changes in Installed Generating Capacity — Mw (Nameplate)

	New Additions	Retirements	Adjustments* Plus	Adjustments* Minus	Net Additions
1946					
Hydro	19	81	1	2	—63
Steam	300	109	16	7	200
Internal Combustion	75	16	12	2	69
Total	**394**	**206**	**29**	**11**	**206**
1947					
Hydro	133	12	5	4	122
Steam	1,835	144	46	15	1,722
Internal Combustion	179	19	5	4	161
Total	**2,147**	**175**	**56**	**23**	**2,005**
1948					
Hydro	697	30	29	15	681
Steam	3,197	71	178	35	3,269
Internal Combustion	289	26	33	8	288
Total	**4,183**	**127**	**240**	**58**	**4,238**
1949					
Hydro	1,070	85	30	13	1,002
Steam	5,356	108	238	150	5,336
Internal Combustion	185	21	46	8	202
Total	**6,611**	**214**	**314**	**171**	**6,540**
1950					
Hydro	1,038	17	14	14	1,021
Steam	4,693	129	205	77	4,692
Internal Combustion	72	17	62	11	106
Total	**5,803**	**163**	**281**	**102**	**5,819**
1951					
Hydro	1,187	13	28	9	1,193
Steam	5,670	176	124	85	5,533
Internal Combustion	111	29	66	18	130
Total	**6,968**	**218**	**218**	**112**	**6,856**
1952					
Hydro	1,460	14	116	11	1,551
Steam	4,892	142	316	252	4,814
Internal Combustion	105	43	45	21	86
Total	**6,457**	**199**	**477**	**284**	**6,451**
1953					
Hydro	1,632	21	24	9	1,626
Steam	7,803	221	129	155	7,556
Internal Combustion	86	34	46	4	94
Total	**9,521**	**276**	**199**	**168**	**9,276**
1954					
Hydro	1,148	19	67	30	1,166
Steam	10,287	450	211	181	9,867
Internal Combustion	97	39	38	39	57
Total	**11,532**	**508**	**316**	**250**	**11,090**
1955†					
Total	**11,990**	**660**	**890**	**195**	**12,025**

Source: Edison Electric Institute and Federal Power Commission. †Estimated. *Adjustments are result of reclassification in ownership between industrial and electric utility plants and rerating of turbines within the electric utility industry.

1955 Production 547 Billion Kwhr



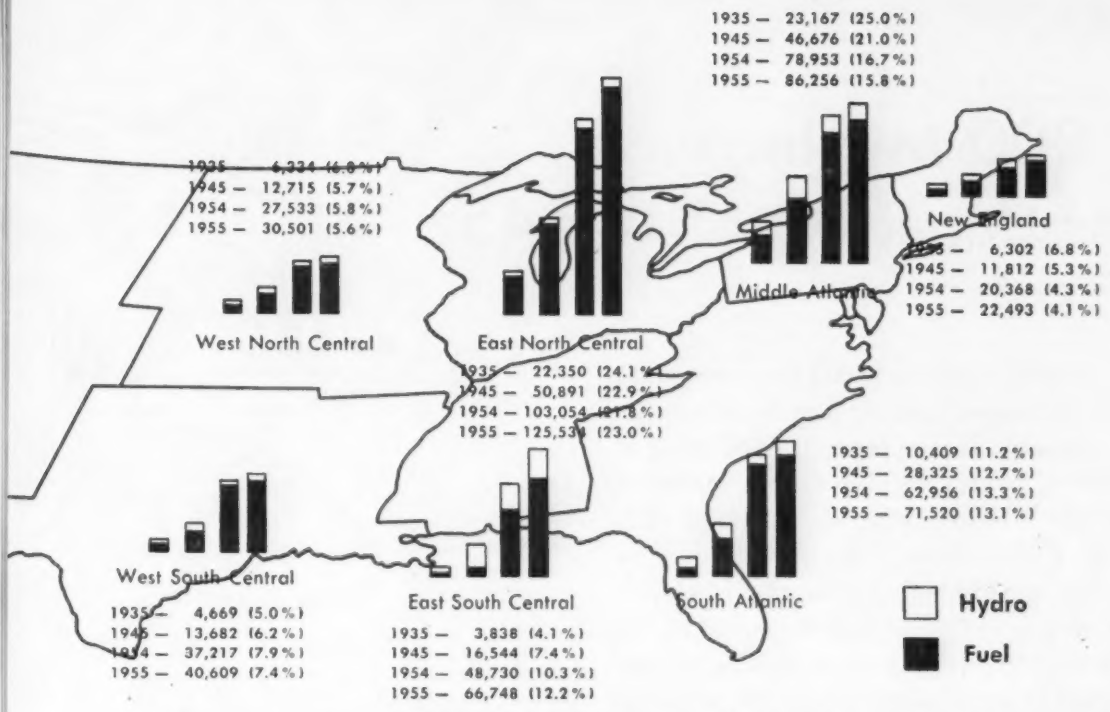
Industry-wide production of electric energy hit 547 billion kwhr in 1955, a 15.9% gain over 1954. Of this amount 435 billion kwhr, or 79.5%, was thermal generation. The remaining 20.5%, 112 billion kwhr, was hydro.

A spectacular 21.8% gain in the East North Central region—was due, in part, to the heavy demands on plants serving Atomic Energy Commission installations.

Source and Disposal of Energy — Millions of Kwhr

	Production		Total Production	Add Net Imports	Less Energy Used by Producer	Total for Distribution	Losses	Sales to Ultimate Consumers
	Fuel	Hydro						
1939	84,078	43,564	127,642	1,900	7,734	121,808	16,040	105,768
1940	94,516	47,321	141,837	937	7,268	135,506	16,863	118,643
1941	113,925	50,863	164,788	927	6,335	159,380	19,320	140,060
1942	122,108	63,871	185,979	1,448	6,611	180,816	21,409	159,407
1943	144,127	73,632	217,759	1,537	9,729	209,567	24,678	185,889
1944	154,244	73,945	228,189	1,597	6,541	223,245	25,084	198,161
1945	142,516	79,970	222,486	1,773	3,368	220,891	27,333	193,558
1946	144,772	78,406	223,178	1,666	4,576	220,268	29,474	190,794
1947	177,314	78,425	255,739	1,269	6,186	250,822	33,241	217,581
1948	200,228	82,470	282,698	1,113	6,368	277,443	36,703	240,740
1949	201,351	89,748	291,099	1,004	5,887	286,216	37,675	248,542
1950	233,203	95,938	329,141	1,283	8,445	321,979	41,440	280,539
1951	270,922	99,751	370,673	1,721	9,356	363,838	44,870	318,168
1952	294,121	105,102	399,224	1,758	10,731	390,251	47,727	342,524
1953	337,432	105,233	442,665	1,365	9,398	434,632	50,388	384,244
1954	364,618	107,068	471,686	1,688	10,864	462,510	51,606	410,904
1955	434,732	112,106	546,838	3,000	13,500	536,338	57,338	479,000

Source: Federal Power Commission and Edison Electric Institute. All data revised to correspond with current basis which excludes former Mining and Manufacturing and Railroad and Railway classification. *Estimated.



Energy Production—Millions of Kwhr and % Total U.S.

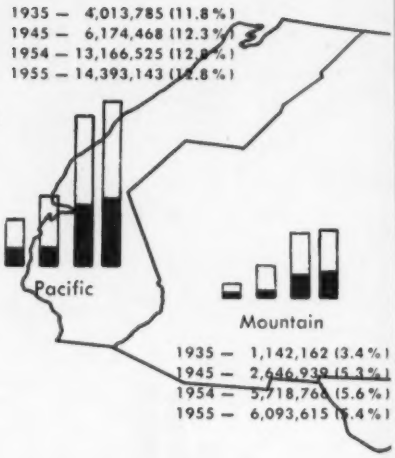
Source: Federal Power Commission. Data for 1955 as of November 1. All bars from left to right: 1935, 1945, 1954, 1955

Production of Electric Energy by Ownership — Millions of Kwhr

	Power Companies		Federal Agencies		Municipal, State & Power District Systems		Cooperatives	
	Production	% Total	Production	% Total	Production	% Total	Production	% Total
1939	115,078	90.2	5,476	4.3	7,088†	5.6	....	..
1940	125,411	88.4	8,583	6.1	7,843†	5.5	....	..
1941	144,289	87.6	10,794	6.6	9,705†	5.9	....	..
1942	158,052	85.0	16,894	9.1	11,033†	5.9	....	..
1943	180,248	82.8	24,484	11.2	13,027†	6.0	....	..
1944	185,850	81.4	28,866	12.7	13,473†	5.9	....	..
1945	180,926	81.3	28,000	12.6	13,560†	6.1	....	..
1946	181,020	81.1	26,960	12.1	15,198†	6.8	....	..
1947	208,106	81.4	29,877	11.7	17,352	6.9	404	0.2
1948	228,231	80.7	35,373	12.5	18,444	6.5	650	0.2
1949	233,112	80.1	38,102	13.1	19,122	6.6	764	0.3
1950	266,860	81.1	40,387	12.3	20,908	6.4	986	0.3
1951	301,845	81.4	44,120	11.9	23,444	6.3	1,264	0.3
1952	322,126	80.7	52,492	13.2	23,080	5.8	1,526	0.4
1953	354,271	80.0	58,064	13.1	28,433	6.4	1,896	0.4
1954	370,970	78.6	67,804	14.4	30,436‡	6.5	2,476‡	0.5
1955*	420,942	77.0	89,083	16.3	33,757‡	6.2	3,056‡	0.6

Source: Federal Power Commission. †Includes Cooperatives. *Estimated. ‡Estimated by Electrical World.

12,000 Mw Increase Ups Capacity to 114,545

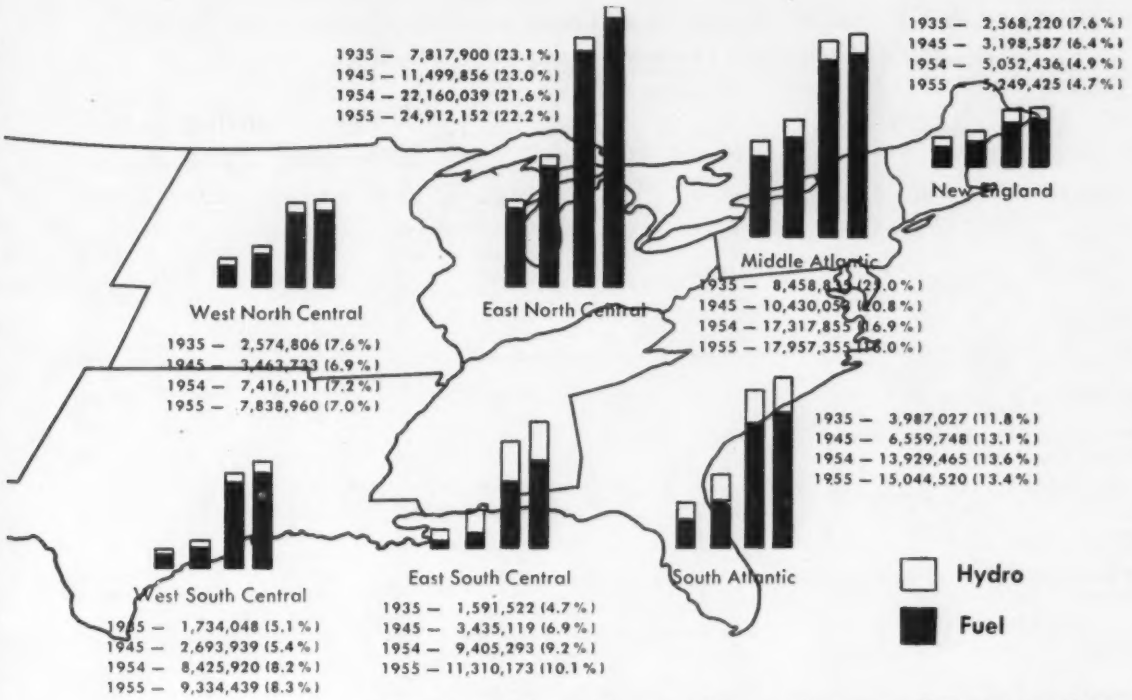


An increase of nearly 12,000 Mw during 1955 marked the biggest capacity gain on record. On Nov. 1 capacity, as recorded by the FPC, stood at 112,134Mw, already topping that in service at the end of 1954 by 9,542 Mw. Scheduled additions for the remainder of the year indicate the total reached 114,545, a gain of 11,953 Mw. Hydro, at year end, stood at an estimated 25,110, a gain of 1,899 Mw. Thermal capacity, at year end, stood at an estimated 89,435 Mw, a gain of 10,053 Mw.

Installed Capacity by Type of Prime Mover — Mw

	Fuel			Hydro			Total	
	Capacity	% Total	Annual Change	Capacity	% Total	Annual Change	Capacity	Annual Change
1939	27,859	71.7	1,024 (3.8%)	11,004	28.3	347 (3.3%)	38,863	1,371 (3.7%)
1940	28,703	71.9	844 (3.0%)	11,224	28.1	220 (2.0%)	39,927	1,064 (2.7%)
1941	30,588	72.1	1,885 (6.6%)	11,817	27.9	593 (5.3%)	42,405	2,478 (6.2%)
1942	32,211	71.5	1,623 (5.3%)	12,842	28.5	1,025 (8.7%)	45,053	2,648 (6.2%)
1943	34,068	71.0	1,857 (5.8%)	13,883	29.0	1,041 (8.1%)	47,951	2,898 (6.4%)
1944	34,603	70.3	535 (1.6%)	14,586	29.7	703 (5.1%)	49,189	1,238 (2.6%)
1945	35,199	70.2	596 (1.7%)	14,912	29.8	326 (2.2%)	50,111	922 (1.9%)
1946	35,468	70.5	269 (0.8%)	14,849	29.5	—63	50,317	206 (0.4%)
1947	37,351	71.4	1,883 (5.3%)	14,971	28.6	122 (0.8%)	52,322	2,005 (4.0%)
1948	40,908	72.3	3,557 (9.5%)	15,652	27.7	681 (4.5%)	56,560	4,238 (8.1%)
1949	46,446	73.6	5,538 (13.5%)	16,654	26.4	1,002 (6.4%)	63,100	6,540 (11.6%)
1950	51,244	74.4	4,798 (10.3%)	17,675	25.6	1,021 (6.1%)	68,919	5,819 (9.2%)
1951	56,907	75.1	5,663 (11.1%)	18,868	24.9	1,193 (6.7%)	75,775	6,856 (9.9%)
1952	61,807	75.1	4,900 (8.6%)	20,419	24.9	1,551 (8.2%)	82,226	6,451 (8.5%)
1953	69,457	75.9	7,650 (12.4%)	22,045	24.1	1,626 (8.0%)	91,502	9,276 (11.3%)
1954	79,382	77.4	9,925 (14.3%)	23,211	22.6	1,166 (5.3%)	102,592	11,090 (12.1%)
Nov. 1, 1955	87,388	77.9	....	24,746	22.1	....	112,134	....
1955‡	89,435	78.1	10,053 (12.7%)	25,110	21.9	1,899 (8.2%)	114,545	11,953 (11.7%)

Source: Federal Power Commission. ‡Estimated by Electrical World.



Generating Capacity — Kw and % Total U. S.

Source: Federal Power Commission. Data for 1955 as of November 1. All bars from left to right: 1935, 1945, 1954, 1955

Generating Capacity by Ownership — Mw

	Power Companies		Federal		Municipal, State and Power District		Cooperatives	
	Capacity	% Total	Capacity	% Total	Capacity	% Total	Capacity	% Total
1939	33,908	87.3	1,650	4.2	3,305†	8.5	...	..
1940	34,398	86.2	1,944	4.9	3,585†	8.9	...	..
1941	36,041	85.0	2,371	5.6	3,993†	9.4	...	..
1942	37,442	83.1	3,216	7.1	4,395†	9.8	...	..
1943	39,128	81.6	4,322	9.0	4,501†	9.4	...	..
1944	39,733	80.8	4,886	9.9	4,570†	9.3	...	..
1945	40,307	80.4	5,081	10.2	4,723†	9.4	...	..
1946	40,335	80.2	4,920	9.8	5,062†	10.0	...	..
1947	41,987	80.2	5,027	9.6	5,141	9.9	167	0.3
1948	45,381	80.2	5,526	9.8	5,453	9.6	200	0.4
1949	50,484	80.0	6,210	9.8	6,168	9.8	238	0.4
1950	55,175	80.1	6,921	10.0	6,511	9.4	312	0.5
1951	60,192	79.4	8,099	10.7	6,993	9.2	491	0.6
1952	64,349	78.4	9,678	11.8	7,667	9.3	532	0.6
1953	71,201	77.8	11,358	12.4	8,343	9.1	600	0.7
1954	79,127	77.1	13,567	13.2	9,130‡	8.9	768‡	0.7
Nov. 1, 1955	85,329	76.1	16,462	14.7	9,553‡	8.5	790‡	0.7
1955‡	87,055	76.0	17,075	14.9	9,625	8.4	790	0.7

Source: Federal Power Commission. †Includes Cooperatives. 1940 and after excludes publicly owned transit systems. ‡Estimated by Electrical World

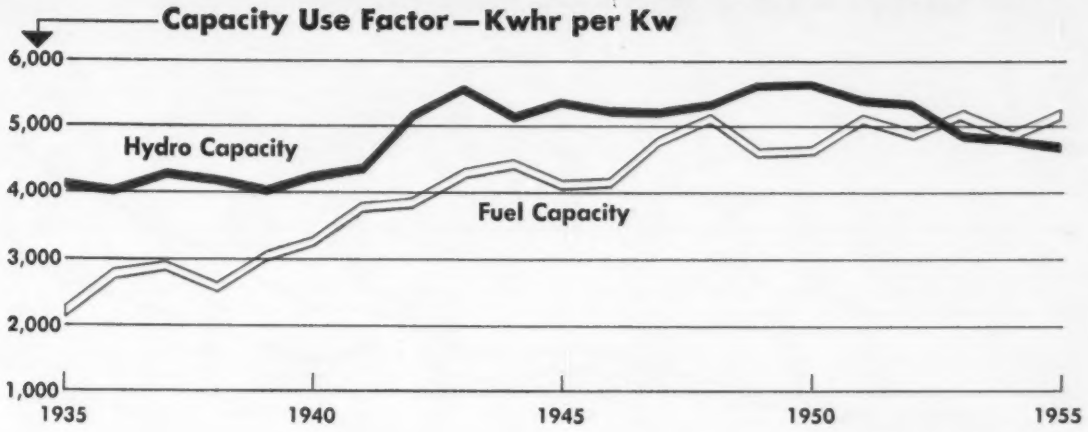
Number and Installed Capacity of Electric Utility Generating Plants By States and Type of Prime Mover — Kw

November 1, 1955

	Number of Utilities[a]	Number of Plants[b]	Total Capacity	Hydro		Steam		Internal Combustion	
				Number	Capacity	Number	Capacity	Number	Capacity
UNITED STATES	**1,431**	**3,625**	**112,133,782**	**1,392**	**24,745,550**	**1,051**	**85,031,495**	**1,182**	**2,356,737**
New England	**94**	**312**	**5,249,425**	**203**	**1,082,341**	**74**	**4,065,875**	**35**	**101,209**
Maine	19	83	593,143	56	318,033	9	235,650	18	39,460
New Hampshire	11	46	475,004	39	259,714	6	213,250	1	2,040
Vermont	14	71	258,757	57	186,937	8	56,775	6	15,045
Massachusetts	33	70	2,172,709	32	180,212	31	1,965,380	7	27,117
Rhode Island	6	10	401,352	3	2,475	5	388,330	2	10,547
Connecticut	11	32	1,348,460	16	134,970	15	1,206,490	1	7,000
Middle Atlantic	**86**	**302**	**17,957,355**	**158**	**1,690,087**	**118**	**16,199,569**	**26**	**67,699**
New York	45	203	8,357,199	145	1,247,292	43	7,063,595	15	46,312
New Jersey	10	20	2,719,456	3	6,350	15	2,709,024	2	4,082
Pennsylvania	31	79	6,880,700	10	436,445	60	6,426,950	9	17,305
East North Central	**274**	**638**	**24,912,152**	**262**	**861,152**	**228**	**23,701,803**	**148**	**349,197**
Ohio	52	87	6,990,057	5	10,525	62	6,937,490	20	42,042
Indiana	41	68	3,987,798	14	35,170	39	3,915,780	15	36,848
Illinois	54	101	6,917,636	10	47,909	60	6,786,583	31	83,144
Michigan	63	186	4,589,650	110	396,097	34	4,063,375	42	130,178
Wisconsin	64	196	2,427,011	123	371,451	33	1,998,575	40	56,985
West North Central	**452**	**863**	**7,838,960**	**112**	**917,899**	**224**	**5,970,563**	**527**	**950,498**
Minnesota	82	176	1,761,864	39	153,671	53	1,428,552	84	179,641
Iowa	93	197	1,551,512	26	139,441	49	1,163,791	122	248,280
Missouri	72	114	1,747,774	6	193,073	35	1,420,115	73	134,586
North Dakota	13	45	263,517	0	0	19	224,790	26	38,727
South Dakota	35	68	491,204	7	284,496	11	137,550	50	69,158
Nebraska	73	136	762,999	30	141,308	20	512,265	86	109,426
Kansas	84	127	1,260,090	4	5,910	37	1,083,500	86	170,680
South Atlantic	**132**	**372**	**15,044,520**	**167**	**3,318,805**	**121**	**11,544,695**	**84**	**181,020**
Delaware	4	6	223,898	0	0	4	216,100	2	7,798
Maryland	11	22	1,372,517	3	271,325	12	1,085,000	7	16,192
District of Columbia	2	3	533,000	1	3,000	2	530,000	0	0
Virginia	23	65	1,931,249	38	399,672	15	1,502,620	12	28,957
West Virginia	10	34	2,184,541	10	100,880	16	2,079,665	8	3,996
North Carolina	30	88	3,481,080	58	1,123,912[c]	19	2,331,750	11	25,418
South Carolina	13	40	1,671,059	27	931,545	9	737,500	4	2,014
Georgia	9	39	1,672,310	26	475,810	11	1,194,250	2	2,250
Florida	30	75	1,974,866	4	12,661	33	1,867,810	38	94,395
East South Central	**44**	**120**	**11,310,173**	**40**	**3,568,080**	**53**	**7,712,160**	**27**	**29,933**
Kentucky	13	31	2,758,057	5	540,860	23	2,208,925	3	8,272
Tennessee	8	36	4,447,963	23	1,736,000	10	2,707,500	3	4,463
Alabama	4	25	3,473,620	12	1,291,220	10	2,180,000	3	2,400
Mississippi	19	28	630,533	0	0	10	615,735	18	14,798
West South Central	**158**	**349**	**9,334,439**	**37**	**945,000**	**112**	**7,975,229**	**200**	**414,210**
Arkansas	18	34	1,165,286	8	388,340	12	745,895	14	31,051
Louisiana	30	60	1,469,801	0	0	16	1,375,100	44	94,701
Oklahoma	40	66	1,262,464	4	165,700	22	1,010,584	40	86,180
Texas	70	189	5,436,888	25	390,960	62	4,843,650	102	202,278
Mountain	**138**	**376**	**6,093,615**	**190**	**3,703,274**	**71**	**2,182,078**	**115**	**208,263**
Montana	8	25	925,152	18	850,910	4	71,800	3	2,442
Idaho	12	47	781,335	42	777,020	0	0	5	4,315
Wyoming	19	51	236,073	19	143,382	12	79,320	20	13,371
Colorado	37	77	947,528	28	247,517	23	662,398	26	37,613
New Mexico	15	32	457,453	4	24,910	13	393,110	15	39,433
Arizona	14	43	1,627,390	12	980,040	11	577,950	20	69,400
Utah	26	85	521,596	58	93,315	8	397,500	19	30,781
Nevada	7	16	597,088	9	586,180	0	0	7	10,908
Pacific	**53**	**293**	**14,393,143**	**223**	**8,658,912**	**50**	**5,679,523**	**20**	**54,708**
Washington	19	55	3,939,727	40	3,712,886	8	221,820	7	5,021
Oregon	14	72	2,046,306	54	1,842,019	12	198,710	6	5,577
California	20	166	8,407,110	129	3,104,007	30	5,258,993	7	44,110

NOTES: [a] Total includes 101 duplications because of utilities having generating plants in more than one state.
[b] Each type of prime mover at combination plants is counted as a separate plant.
[c] Reflects inclusion of 289,500 kilowatts formerly classified as industrial generating capacity.

Source: Federal Power Commission



Coal Rate Drops to 0.96 Lb

Fuel plants continue to become more efficient as evidenced by a further decline in the coal rate. This year the coal rate hit a new low of 0.96 lb per kwhr—a drop of 3% from 1954. Over the past decade, the coal rate has been improved 26%.

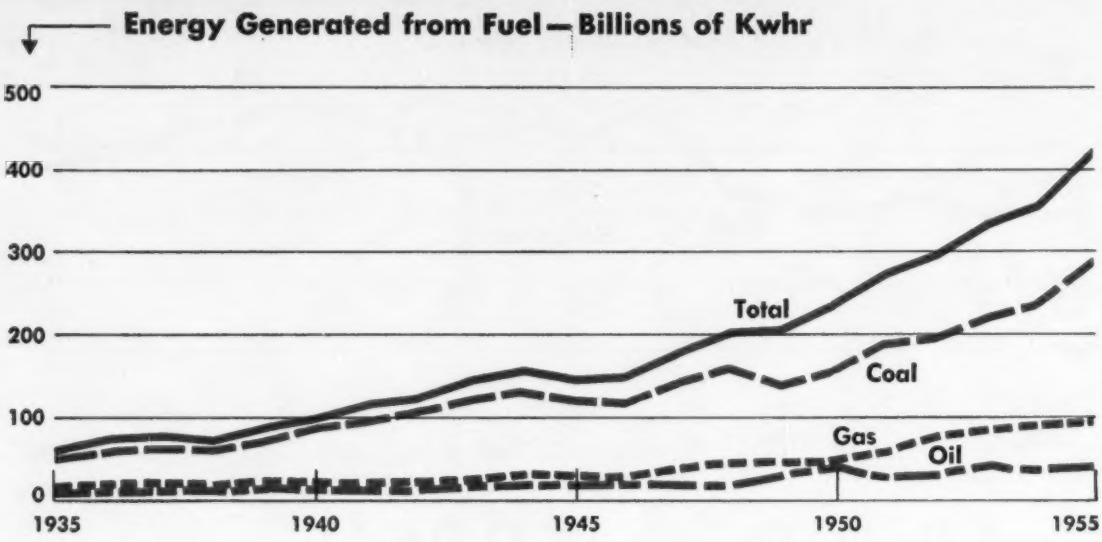
Of the total energy produced thermally, coal represented over 68%—a jump of over 20% in energy produced from this fuel in 1954. Coal consumption for the year was 138 million tons—20 million tons higher than 1954. This represents a 17% increase over 1954's 118 tons.

Use of oil increased by 10% to 73 million bbl while gas use declined by 3 billion cu ft to a total of 1,163 billion cu ft. Power generated from oil rose 14% above 1954 representing over 8% of all energy produced thermally.

Production, Capacity, Average Use

	Production Millions of Kwhr			Year End Capacity Thousands of Kw			Kwhr per Kw of Average Capacity		
	Fuel	Hydro	Total	Fuel	Hydro	Total	Fuel	Hydro	Total
1939	84,078	43,564	**127,642**	27,859	11,004	**38,863**	3,074	4,022	**3,343**
1940	94,516	47,321	**141,837**	28,703	11,224	**39,927**	3,342	4,258	**3,600**
1941	113,925	50,863	**164,788**	30,588	11,817	**42,405**	3,843	4,415	**4,003**
1942	122,109	63,871	**185,979**	32,211	12,842	**45,053**	3,889	5,180	**4,253**
1943	144,127	73,632	**217,759**	34,067	13,884	**47,951**	4,349	5,510	**4,683**
1944	154,244	73,945	**228,189**	34,603	14,586	**49,189**	4,492	5,195	**4,698**
1945	142,516	79,970	**222,486**	35,199	14,912	**50,111**	4,078	5,422	**4,481**
1946	144,772	78,406	**223,178**	35,468	14,849	**50,317**	4,097	5,269	**4,445**
1947	177,313	78,426	**255,739**	37,351	14,971	**52,322**	4,870	5,260	**4,983**
1948	200,228	82,470	**282,698**	40,908	15,652	**56,560**	5,052	5,386	**5,193**
1949	201,351	89,748	**291,099**	46,446	16,654	**63,100**	4,610	5,561	**4,865**
1950	233,203	95,938	**329,141**	51,244	17,675	**68,919**	4,774	5,589	**4,986**
1951	270,922	99,751	**370,673**	56,907	18,868	**75,775**	5,010	5,460	**5,123**
1952	294,121	105,102	**399,224**	61,807	20,419	**82,226**	4,955	5,350	**5,054**
1953	337,431	105,233	**442,665**	69,457	22,045	**91,502**	5,141	4,957	**5,096**
1954	364,619	107,069	**471,686**	79,382	23,211	**102,592**	4,899	4,732	**4,860**
1955*	434,732	112,106	**546,838**	89,435	25,110	**114,545**	5,150	4,640	**5,037**

Source: Federal Power Commission. *Estimated. 1945 and after excludes former Mining and Manufacturing and Railroad and Railway classifications.



In spite of the slight decline in the use of gas, the energy generated from gas increased 2%, revealing higher efficiency. However, of the total power produced in fuel plants, gas accounted for only 23% as against 26% in 1954.

Coal and the equivalent of oil and gas consumed over the past year amounted to 201 million tons, an increase of more than 11% over last year's 180 million tons.

The use of hydro capacity continued its decline of the past five years. The ratio of hydro output per kw dropped 92 hours to 4,640 and for the third year fell below fuel capacity use factor.

The use of fuel capacity hit a record high, rising 251 hours in 1955 to 5,150. This brought the total hours of capacity use to 5,037, an increase of 177 hours over the 4,860 reported in 1954.

Consumption of Coal, Oil and Gas

	Energy Generated From Coal, Oil, and Gas				Coal, Oil, and Gas Consumed				Coal Rate
	Coal Billions of Kwhr	Oil Billions of Kwhr	Gas Billions of Kwhr	Total Billions of Kwhr	Coal Millions of Tons	Oil Millions of Bbls	Gas Billions of Cu Ft	Coal and Equivalent of Oil and Gas Millions of Tons	Pounds per Kwhr
1939.....	64.7	7.3	11.6	83.6	44.54	17.14	188.88	57.60	1.38
1940.....	76.8	6.2	10.9	94.0	51.47	16.33	180.10	62.94	1.34
1941.....	93.8	7.5	12.0	113.3	62.67	20.08	201.76	75.70	1.34
1942.....	101.9	5.6	14.1	121.6	66.26	15.24	235.21	79.08	1.30
1943.....	119.2	6.8	17.8	143.8	77.30	17.99	301.94	93.27	1.30
1944.....	124.1	8.1	21.6	153.9	80.08	20.86	358.78	99.25	1.29
1945.....	114.8	7.8	19.7	142.3	74.72	20.23	326.21	92.64	1.30
1946.....	111.7	14.1	18.8	144.6	72.20	36.32	306.94	93.47	1.29
1947.....	137.0	16.9	23.1	177.0	89.53	45.31	373.05	115.67	1.31
1948.....	152.9	16.8	30.1	199.8	99.59	42.64	478.10	130.12	1.30
1949.....	135.5	28.5	37.0	201.0	83.96	66.30	550.12	124.57	1.24
1950.....	154.5	33.7	44.6	232.8	91.87	75.42	628.92	138.42	1.19
1951.....	185.2	28.7	56.6	270.5	105.77	63.94	763.90	154.50	1.14
1952.....	195.4	29.7	68.5	293.6	107.07	67.22	910.12	160.87	1.10
1953.....	218.9	38.4	79.8	337.1	115.90	82.24	1,034.27	178.49	1.06
1954.....	239.1	31.5	93.7	364.3	118.38	66.74	1,165.50	180.37	0.99
1955*.....	288.4‡	35.9‡	95.5‡	420.2†	138.22	73.13	1,162.81	201.29	0.96

Source: Federal Power Commission. *Twelve months ended November 1. †Small amount of energy generated from wood included in 1955. ‡Preliminary.

Analysis of Fuel Burned Under Boilers and by Internal Combustion Engines

		Btu per Net Kwh	Cost per Million Btu Consumed ¢	Cost of Fuel per Net Kwh ¢	% Net Fuel Generation Reported	Average Cost per Million Btu Consumed — ¢ Coal[a]	Oil[b]	Gas[c]	Coal[a] $ per ton	Coal[a] Btu per lb	Oil[b] $ per bbl	Oil[b] Btu per gal	Gas[c] $ per M cu ft	Gas[c] Btu per cu ft
United States	1954	12,180	24.4	.30	95.1	25.9	33.3	18.0	6.25	12,087	2.11	150,463	.183	1,019
	1953	12,889	25.2	.33	95.0	27.1	32.4	16.7	6.52	12,011	2.05	150,587	.167	1,000
	1952	13,361	25.0	.33	94.1	27.1	33.8	15.3	6.54	12,059	2.14	150,439	.147	965
	1951	13,641	24.9	.34	94.4	26.8	33.6	14.1	6.42	11,968	2.11	150,137	.136	972
	1950	14,030	24.8	.35	93.6	26.9	31.8	12.3	6.38	11,839	2.00	149,699	.118	960
New England	1954	13,035	35.1	.46	97.3	35.2[d]	35.0	34.1	9.69[d]	13,746	2.21	150,081	.343	1,006
	1953	13,317	35.5	.47	97.6	36.3[d]	34.7	34.0	9.91[d]	13,665	2.19	150,520	.344	1,010
	1952	13,543	36.7	.50	96.0	37.3[d]	35.9	36.9	10.20[d]	13,694	2.26	150,000	.376	1,020
	1951	13,970	35.8	.50	95.6	36.0[d]	35.5	—	9.93[d]	13,775	2.24	150,227	—	—
	1950	14,473	34.3	.50	95.7	36.0[d]	32.9	—	9.89[d]	13,728	2.08	150,486	—	—
Middle Atlantic	1954	12,178	29.6	.36	98.2	28.9	34.1	29.0	7.43	12,847	2.15	150,018	.304	1,047
	1953	13,127	30.1	.39	98.9	29.6	33.4	29.4	7.52	12,717	2.10	150,176	.311	1,056
	1952	13,748	29.5	.41	98.6	28.9	35.5	26.5	7.44	12,879	2.24	150,138	.279	1,053
	1951	13,964	29.0	.40	98.7	28.3	35.9	26.3	7.20	12,739	2.26	149,962	.274	1,052
	1950	14,315	28.5	.41	98.3	27.4	32.3	26.0	6.90	12,604	2.03	149,790	.258	991
East North Central	1954	12,007	24.7	.30	95.4	24.8	69.8	22.5	5.78	11,643	4.19	142,987	.189	841
	1953	12,709	25.6	.33	95.5	26.0	65.7	20.2	6.03	11,601	3.96	143,548	.158	783
	1952	12,899	25.2	.32	95.9	25.7	70.5	19.3	5.97	11,603	4.22	142,458	.168	867
	1951	13,123	25.6	.34	95.4	25.7	72.6	20.2	5.90	11,484	4.40	144,445	.121	601
	1950	13,462	26.4	.36	95.3	26.4	59.0	18.2	6.03	11,415	3.58	144,564	.108	594
West North Central	1954	14,027	24.6	.35	78.9	27.2	38.6	21.8	5.60	10,293	2.41	148,487	.205	943
	1953	14,838	24.9	.37	78.7	28.4	48.3	20.6	5.85	10,282	2.69	147,840	.182	884
	1952	15,854	24.5	.39	74.3	28.4	47.5	19.0	5.68	9,994	2.96	148,097	.138	726
	1951	16,198	24.6	.40	71.5	28.4	53.7	17.3	5.61	9,891	3.29	146,073	.134	774
	1950	16,659	24.0	.40	70.3	29.1	51.8	15.0	5.77	9,908	3.14	144,399	.117	782
South Atlantic	1954	11,560	27.1	.31	96.2	26.6	34.0	22.0	6.84	12,880	2.16	150,817	.227	1,032
	1953	12,138	27.3	.33	95.8	27.2	32.4	21.4	6.98	12,819	2.04	150,237	.219	1,025
	1952	12,546	27.3	.34	95.8	27.2	33.6	18.8	7.00	12,841	2.12	150,603	.192	1,021
	1951	12,978	26.8	.35	96.5	26.7	33.7	18.3	6.86	12,862	2.12	149,815	.188	1,023
	1950	13,295	26.4	.35	95.7	26.5	31.2	15.2	6.76	12,747	1.96	149,779	.155	1,023
East South Central	1954	11,022	18.3	.20	98.9	18.6	49.6	17.0	4.45	11,956	3.16	151,923	.177	1,042
	1953	11,564	18.9	.22	98.5	20.0	32.6	15.9	4.72	11,829	1.96	143,159	.167	1,045
	1952	12,543	18.5	.23	97.7	20.1	45.9	14.6	4.76	11,863	2.87	148,814	.152	1,039
	1951	13,560	18.3	.25	96.8	20.2	44.0	13.9	4.78	11,856	2.75	148,815	.144	1,035
	1950	13,472	19.1	.26	95.6	21.7	43.0	13.8	5.10	11,771	2.69	148,814	.141	1,025
West South Central	1954	12,951	10.3	.13	92.0	11.5	44.3	10.2	2.39	10,345	2.73	146,339	.108	1,055
	1953	13,559	9.6	.13	91.2	11.4	44.0	9.5	2.52	11,027	2.64	143,079	.101	1,057
	1952	13,706	9.1	.13	87.2	18.9	44.3	8.9	4.39	11,618	2.72	146,151	.094	1,053
	1951	14,017	8.5	.12	91.9	19.6	40.9	8.3	4.51	11,496	2.54	147,771	.088	1,057
	1950	14,739	7.7	.11	89.0	18.7	25.0	7.5	4.49	12,024	1.55	147,662	.080	1,063
Mountain	1954	13,324	21.2	.28	90.1	22.3	25.7	20.4	4.63	10,382	1.63	151,464	.197	963
	1953	14,053	20.3	.28	88.7	23.0	24.5	18.5	4.86	10,580	1.56	151,148	.178	961
	1952	14,739	19.1	.28	87.7	22.6	26.3	16.6	4.69	10,352	1.66	150,233	.160	966
	1951	15,063	18.8	.28	87.6	22.7	38.0	16.4	4.67	10,274	2.35	147,628	.159	969
	1950	16,013	18.1	.29	85.9	22.6	42.8	15.7	4.63	10,246	2.63	146,143	.152	967
Pacific	1954	12,577	24.9	.31	99.7	13.3[e]	28.3	24.1	0.82	3,066[e]	1.80	151,531	.263	1,091
	1953	12,977	25.9	.34	97.7	13.3[e]	28.7	24.0	0.78	2,923[e]	1.83	151,756	.262	1,094
	1952	14,218	25.3	.36	96.2	12.4[e]	28.7	23.1	0.76	3,069[e]	1.82	151,547	.251	1,086
	1951	13,385	23.4	.31	96.1	11.3[e]	26.7	20.8	0.70	3,114[e]	1.69	151,047	.226	1,089
	1950	13,920	19.9	.28	96.2	10.7[e]	21.5	19.6	0.70	3,259[e]	1.35	149,799	.213	1,084

a Coal includes bituminous and anthracite coal, and relatively small amounts of coke, lignite, wood, and corn residue.
b Oil includes fuel oil, crude oil, and small amounts of tar and gasoline.
c Gas includes natural and manufactured gas and waste gas.
d Includes bbl. of oil converted to equivalent tons of coal.
e Cords and cubic feet of hogged wood converted to pounds and tons.

SOURCE: Edison Electric Institute.

Electrical Manufacturing's Best Year

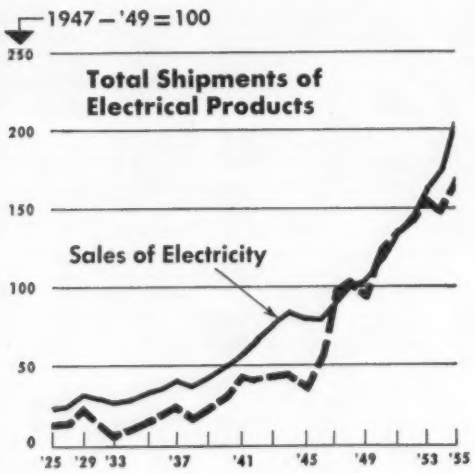
Total dollar shipments by the electrical manufacturing industry amounted to $17.4 billion in 1955 as compared with $15.4 billion in 1954 and $16.3 billion in 1953, the previous record high for the industry.

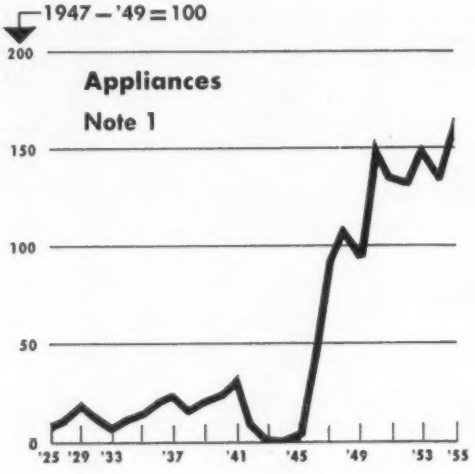
In the appliance field alone the industry shipped a record $4½ billion in 1955. This includes 4,025,000 electric refrigerators, 1,100,000 electric freezers, 4,400,000 washing machines, 1,290,000 room coolers, 1,600,000 electric ranges, 900,000 electric water heaters, 7,800,000 radios, 7,900,000 television sets, and $413 million of electric housewares. This volume also reflects the ever-continuing acceptance of comparatively new electric appliances: 295,000 dishwashers, 520,000 food waste disposers, 1,100,000 electric dryers, and 1,350,000 electric bed coverings.

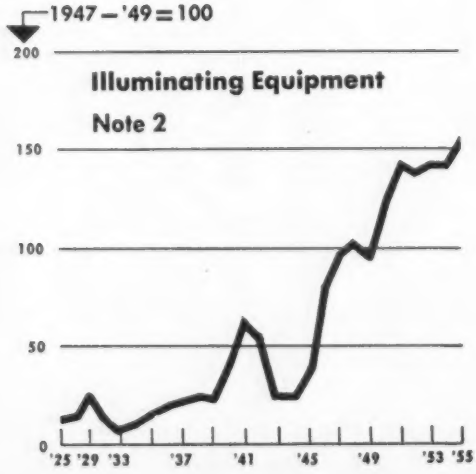
Reflecting the expanding use of electrical energy in the industrial field, the industry in 1955 shipped $2.2 billion worth of such products as motors and controls, welding equipment, industrial electron tubes, and metallic rectifiers.

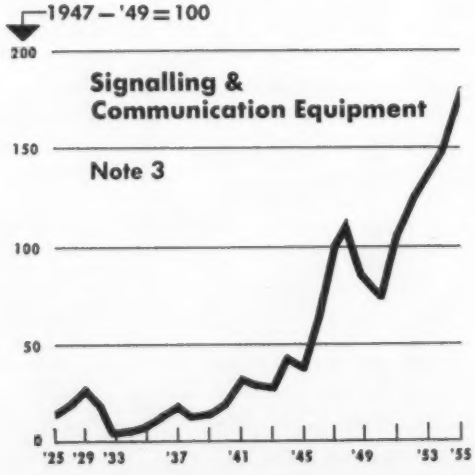
The effects of building construction on the industry is demonstrated by the shipment of $720 million of lighting equipment of all types and $602 million of such products as rigid steel conduit, conduit fittings, low voltage fuses, switches, molded case breakers.

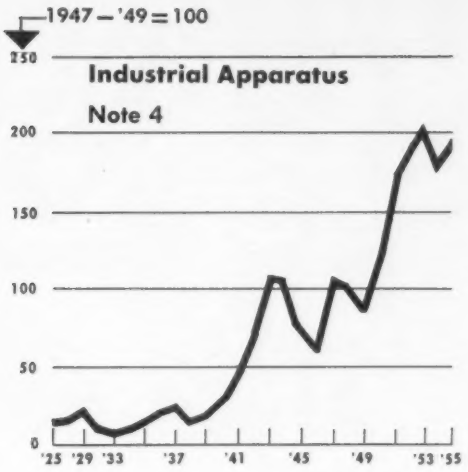
To generate, transmit, and deliver the electrical energy required by all of the equipment described thus far, the industry had to produce $1.7 billion of generating, transmission and distribution equipment, $1.5 billion of electrical wire and cable; and $340 million of insulating materials.







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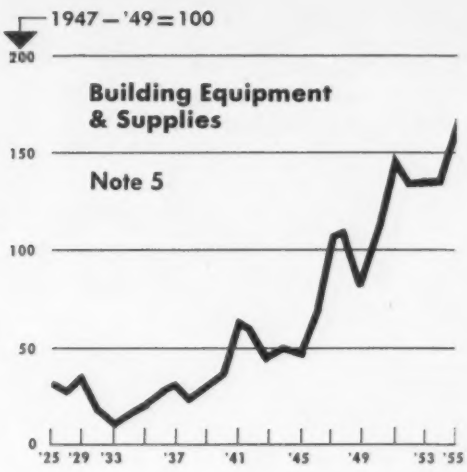
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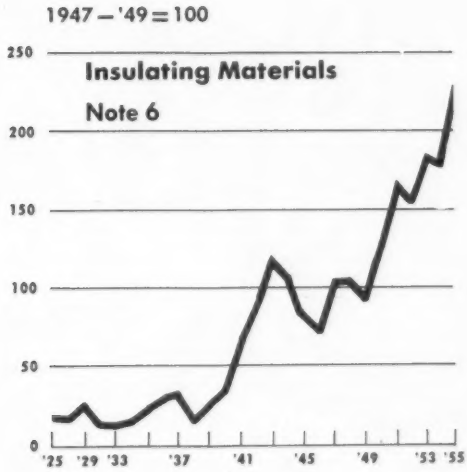
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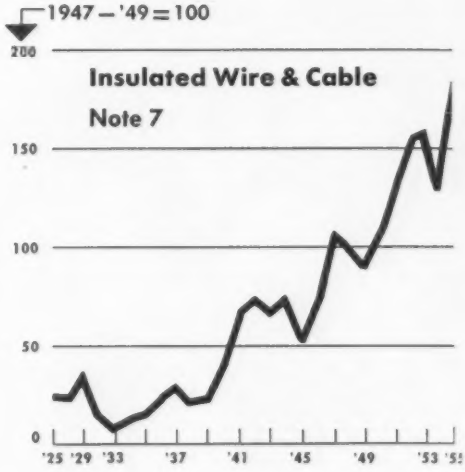
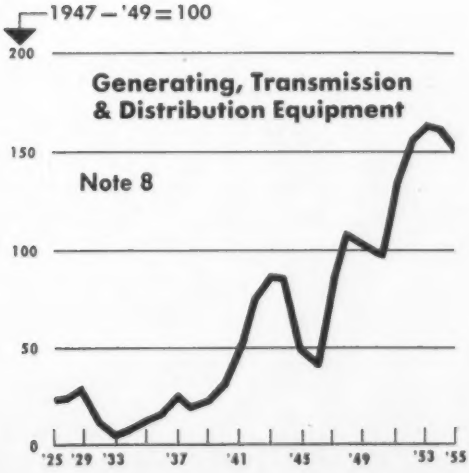
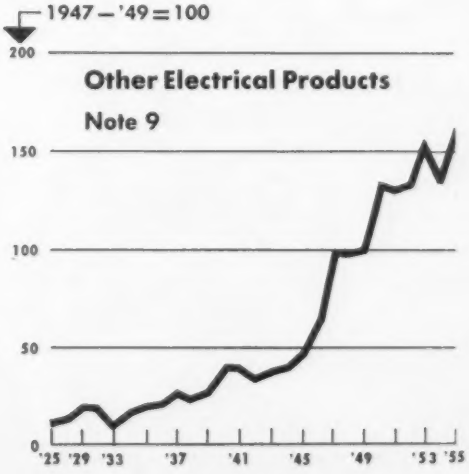
50
0
'25 '29 '33 '37 '41 '45 '49 '53 '55


1947 – '49 = 100
200
Insulated Wire & Cable
Note 7
150
100
50
0
'25 '29 '33 '37 '41 '45 '49 '53 '55


1947 – '49 = 100
200
Generating, Transmission
& Distribution Equipment
Note 8
150
100
50
0
'25 '29 '33 '37 '41 '45 '49 '53 '55


1947 – '49 = 100
200
Other Electrical Products
Note 9
150
100
50
0
'25 '29 '33 '37 '41 '45 '49 '53 '55

Total Shipments of Electrical Products 1925-1955

Shipments in Millions of Dollars, Indexes Based on Average Year 1947-1949 = 100

	1		2		3		4		5		6		7		8		9			
	Appliances	Index	Illuminating Equipment	Index	Signal and Communication Equipment	Index	Industrial Apparatus	Index	Building Equipment and Supplies	Index	Insulating Materials	Index	Insulated Wire and Cable	Index	Generating Transmission & Distribution Equipment	Index	Other Electrical Products	Index	Total	Index
1925.....	272.4	9.9	62.6	13.4	107.0	15.3	173.7	15.1	108.0	30.3	29.7	20.0	210.6	25.4	254.3	23.5	339.0	12.1	1,557.4	15.2
1927.....	344.2	12.5	80.4	17.2	153.3	21.9	185.5	16.1	103.8	29.1	29.5	19.9	210.0	25.3	277.9	25.7	384.3	13.8	1,769.0	17.2
1929.....	609.8	22.2	129.3	27.6	201.1	28.7	264.3	23.0	134.7	37.7	42.2	28.4	312.6	37.6	324.5	30.0	578.1	20.7	2,596.6	25.3
1931.....	381.0	13.9	65.6	14.0	130.6	18.7	133.6	11.6	73.8	20.7	21.7	14.6	120.2	14.5	176.0	16.3	528.6	18.9	1,631.2	15.9
1933.....	265.6	9.7	36.5	7.8	27.6	3.9	89.6	7.8	47.0	13.2	20.6	13.9	75.0	9.0	66.2	6.1	341.5	12.2	969.6	9.4
1934.....	349.7	12.7	50.7	10.8	45.1	6.5	128.0	11.1	60.4	16.9	26.5	17.9	96.1	11.6	92.1	8.5	467.4	16.7	1,316.1	12.8
1935.....	435.8	15.8	70.9	15.1	55.7	8.0	161.3	14.0	73.3	20.5	34.9	23.5	122.2	14.7	134.0	12.4	597.9	21.4	1,686.1	16.4
1936.....	600.6	21.8	98.6	21.1	79.6	11.4	233.8	20.3	96.2	26.9	44.9	30.2	191.9	23.1	195.8	18.1	636.2	22.8	2,177.5	21.2
1937.....	647.0	23.5	106.8	22.8	137.9	19.7	286.9	25.0	115.0	32.2	49.2	33.1	245.3	29.5	301.5	27.9	781.6	28.0	2,671.2	26.0
1938.....	469.4	17.1	117.6	25.1	95.7	13.7	179.9	15.6	82.7	23.2	28.1	18.9	169.1	20.4	222.5	20.6	681.1	24.4	2,045.9	19.9
1939.....	607.5	22.1	113.2	24.2	114.5	16.4	228.9	19.9	108.7	30.4	41.5	27.9	204.4	24.6	247.9	22.9	787.3	28.2	2,453.8	23.8
1940.....	678.8	24.7	206.5	44.2	151.9	21.8	327.3	28.5	131.1	36.7	55.3	37.2	319.3	38.5	331.2	30.6	1,142.9	40.9	3,344.4	32.5
1941.....	921.1	33.5	303.3	64.9	240.3	34.4	578.4	50.3	227.1	63.5	102.1	68.7	548.9	66.2	544.3	50.3	1,104.1	39.5	4,569.6	44.4
1942.....	284.9	10.3	261.2	55.8	220.9	31.6	875.9	76.1	213.5	59.7	139.0	93.5	615.2	74.2	802.9	74.2	1,000.9	35.8	4,414.3	42.9
1943.....	54.3	2.0	120.2	25.7	214.2	30.7	1,246.7	108.4	172.4	48.8	180.2	121.2	563.9	68.0	966.0	89.3	1,048.8	37.5	4,566.8	44.4
1944.....	40.8	1.5	121.2	25.9	317.8	45.5	1,214.3	105.5	179.3	50.2	160.5	108.0	628.4	75.8	948.6	87.7	1,122.8	40.2	4,733.7	46.0
1945.....	145.0	5.2	187.1	40.0	283.3	40.6	869.8	75.6	176.4	49.3	127.7	86.0	445.7	53.8	546.7	50.5	1,328.5	47.5	4,110.2	39.9
1946.....	1,231.6	44.6	383.9	82.0	468.5	67.1	739.8	64.3	234.5	65.6	113.4	76.3	603.2	72.7	469.6	43.4	1,809.4	64.8	6,053.9	58.8
1947.....	2,530.6	91.6	460.8	98.4	702.6	100.6	1,234.5	107.3	378.1	105.8	154.6	104.1	895.1	107.9	911.5	84.2	2,780.4	99.5	10,048.2	97.7
1948.....	3,033.5	109.8	483.5	103.3	791.1	113.3	1,193.4	103.8	395.7	110.8	156.4	105.4	838.7	101.1	1,202.6	111.1	2,763.5	98.9	10,858.5	105.6
1949.....	2,721.2	98.5	459.6	98.2	599.9	85.9	1,020.0	88.7	297.9	83.4	134.2	90.4	752.8	90.8	1,132.3	104.6	2,830.9	101.3	9,948.9	96.7
1950.....	4,216.5	152.6	582.0	124.3	535.8	76.7	1,422.0	123.7	403.7	113.0	193.2	130.1	879.9	106.2	1,095.9	101.3	3,739.4	133.8	13,068.5	127.1
1951.....	3,791.2	137.2	667.4	142.6	731.7	104.8	1,985.6	172.7	533.7	149.4	248.9	167.8	1,097.1	132.4	1,437.3	132.8	3,675.4	131.6	14,168.3	137.7
1952.....	3,688.6	133.5	647.8	138.4	885.8	127.4	2,214.3	192.5	474.6	132.8	236.9	159.6	1,265.9	152.8	1,709.7	158.0	3,756.0	134.5	14,883.6	144.8
1953.....	4,155.2	150.3	670.3	143.3	961.1	137.6	2,351.2	204.5	478.2	133.9	274.1	184.7	1,310.5	158.1	1,780.1	164.5	4,329.7	155.0	16,310.4	158.7
1954.....	3,991.1	144.5	670.7	143.4	1,053.7	151.0	2,120.5	184.5	491.7	137.6	267.4	180.2	1,140.7	137.6	1,768.3	163.4	3,931.0	140.8	15,435.1	150.1
1955.....	4,495.8	162.8	720.3	153.9	1,260.0	180.6	2,248.5	195.6	601.7	168.4	339.5	228.8	1,525.9	184.1	1,657.5	153.2	4,521.0	161.9	17,370.2	168.9

The data shown in this tabulation are based upon total industry shipments including exports and interplant transfers of electrical products which are considered to cover, not only those products included in the Electrical Machinery Group as defined by the U. S. Census of Manufacturers, but also lighting fixtures, steam engines and turbines, household and commercial refrigeration machinery, air conditioning machinery, household laundry equipment, vacuum cleaners and electrical insulating materials such as porcelain, mica, laminated products, vulcanized fiber, varnished fabric and paper.

Non-Electrical Products: Including non-electrical defense and war material, manufactured within the industry, **have not been** included in these data.

The product content of each of the nine branches of the electrical manufacturing industry is as follows:

1. Appliances, includes, electric household refrigerators, electric farm and home freezers, electric ranges, electric water heaters, electric housewares, electric fans, electric commercial cooking equipment, electric dehumidifiers, electric household food waste disposers and dishwashers, packaged room air conditioners, electric dryers, electric ironers, electric washing machines, vacuum cleaners, and radio and television receiving sets.

2. Illuminating Equipment includes, industrial, commercial and residential lighting equipment; aviation ground lighting, floodlighting and street lighting equipment; vehicular, railway and other lighting equipment; and portable lamps.

3. Signalling and Communication Equipment includes, signalling apparatus, telephone and telegraph equipment, and electric railway signals and attachments.

4. Industrial Apparatus includes, carbon products, commutators, electronic tubes, (except radio and cathode ray), welding wire, welding machines, resistance welders, industrial heating units and devices, industrial controls, induction and dielectric heating apparatus, mining belt conveyors, motors and generators (except large apparatus), mining and industrial electric locomotives, metallic rectifiers, and renewal parts for motors, generators and mining and industrial locomotives.

5. Building Equipment and Supplies includes, conduit fittings, metallic and plastic outlet and switch boxes, rigid steel conduit and electrical metallic tubing and fittings, wiring devices, molded case breakers, busways, fuses, switch and enclosed breakers, and panelboards and distribution boards.

6. Electrical Insulating Materials includes, standard and special dry process electrical porcelain, steatite electrical products, laminated products, manufactured electrical mica, varnished fabric and paper, varnished tubing and saturated sleeving, and vulcanized fiber.

7. Insulated Wire and Cable includes, rubber and thermoplastic power and control cable, asbestos insulated wire and cable, flexible cords, cord sets, fixture and appliance wire, magnet wire, paper power cable, building wire and cable, portable molded rubber sheathed cord and cable, varnished cambric cable, weatherproof and slow-burning wire, communication and signal wire and cable, automotive, aircraft and marine wire and cable, and non-metallic sheathed cable.

8. Generation, Transmission, and Distribution Equipment includes, power capacitors, electric measuring and test equipment, transmission and distribution voltage regulators, hydraulic turbines, high voltage insulators, lightning protective devices, generating and converting apparatus, marine turbine-propulsion, overhead trolley line materials, switchgear, power and distribution transformers, land steam and gas turbines, pole line hardware, rail bonds, transmission hardware, and other related products.

9. Other Electrical Products includes, radio, electronic and television transmission and communication equipment, automatic temperature controls, specialty capacitors, specialty transformers, ballasts (fluorescent), time switches, X-ray tubes, X-ray apparatus, land transportation motors and controls, electric lamps, air conditioning and commercial refrigeration equipment, radio receiving-type tubes, cathode ray tubes, engine electrical equipment, phonographs, phonograph records, recording devices, storage batteries, primary batteries, electrical hearing aids, lamp components, Christmas tree lighting outfits, and other related products.

Source: National Electrical Manufacturers Association.

Industrial Use of Electric Energy

Industry is today using more than 320 billion kwhr annually. Detailed data for 1953 indicate that manufacturers use nearly 90% of this total with primary metals, chemical, nuclear, and paper industries alone using nearly 50%

All Manufacturing Industries

	Purchased	Generated	Sold†	Utilized
		(Millions of Kwhr)		
1929	36,217	20,905	2,000	55,122
1939	44,847	28,593	2,922	70,518
1944	105,610	44,160	4,755	145,015
1947	104,822	45,236	5,811	144,247
1950	133,581	53,953	6,199	181,335
1951	150,331	57,095	7,104	200,322
1952	158,957	57,806	7,256	209,507
1953	169,200	66,569	7,321	228,448

Food and Kindred Products

1929	4,016	1,080	55	5,041
1939	4,949	1,470	80	6,339
1944	7,115	1,676	67	8,724
1947	8,427	1,838	85	10,180
1950	10,827	1,897	90	12,634
1951	11,085	1,924	89	12,920
1952	11,330	1,958	90	13,198
1953	10,447	2,039	90	12,396

Tobacco Manufacturers

1929	38	39	3	74
1939	66	53	4	115
1944	104	63	3	164
1947	155	76	12	219
1950	186	80	13	253
1951	202	88	14	276
1952	221	88	14	295
1953	243	91	14	320

Textile Mill Products

1929	3,790	1,507	117	5,180
1939	5,201	1,772	171	6,802
1944	7,049	2,004	237	8,816
1947	8,288	1,959	206	10,041
1950	10,715	1,983	220	12,478
1951	11,184	1,861	196	12,849
1952	11,780	1,673	176	13,277
1953	11,599	1,745	178	13,166

Apparel and Related Products

1929	253	19	1	271
1939	343	14	1	356
1944	533	13	1	545
1947	837	18	5	850
1950	1,654	9*	2*	1,661*
1951	1,661	5*	1*	1,665*
1952	1,752	4*	1*	1,755*
1953	1,929	1	0	1,930

Lumber and Products (Except Furniture)

	Purchased	Generated	Sold†	Utilized
		(Millions of Kwhr)		
1929	441	822	127	1,136
1939	660	941	186	1,415
1944	547	1,134	219	1,462
1947	1,503	1,004	169	2,338
1950	2,841	1,350	180	4,011
1951	3,199	1,369	230	4,338
1952	3,616	1,351*	245	4,722*
1953	3,855	1,379	240	4,994

Furniture and Fixtures

1929	233	84	25	292
1939	289	113	37	365
1944	640	120	20	740
1947	705	128	7	826
1950	856	118	8	966
1951	1,133	102	6	1,229
1952	1,144	86	5	1,225
1953	1,219	82	4	1,297

Paper and Allied Products

1929	3,141	4,645	145	7,641
1939	3,430	6,284	212	9,502
1944	3,657	8,003	662	10,998
1947	6,175	9,626	415	15,386
1950	7,697	11,910	442	19,165
1951	8,203	12,631	544	20,290
1952	8,563	12,759*	545	20,777*
1953	8,325	13,805	552	21,578

Printing and Publishing Industries

1929	681	31	2	710
1939	812	50	3	859
1944	1,070	41	10	1,101
1947	1,251	39	10	1,280
1950	1,738	23	10	1,751
1951	2,514	21	5	2,530
1952	2,758	20	5	2,773
1953	3,034	21	5	3,050

Chemicals and Allied Products

1929	4,331	3,126	115	7,342
1939	5,357	4,349	168	9,538
1944	19,380	10,759	852	29,287
1947	11,963	8,058	411	19,610
1950	16,001	10,395	438	25,958
1951	18,453	11,329	578	29,204
1952	19,204	11,663	595	30,272
1953	17,876	13,185	600	30,461

Based on data published by the Bureau of the Census, Department of Commerce, Atomic Energy Commission and the Federal Power Commission with adjustments for comparability with 1947 classification.

†Data for 1950-1953 estimate based on partial coverage indicating that relation of sales to generation has not changed significantly.

*Revised.

Nuclear Energy and Allied Products

	Purchased	Generated	Sold†	Utilized
		(Millions of Kwhr)		
1944	890	270	‡	1,160
1947	2,000	1,300	‡	3,300
1950	2,359	1,475	‡	3,834
1951	3,800	1,700	‡	5,500
1952	6,825	1,700	‡	8,525
1953	13,150	2,100	‡	15,250

Petroleum and Coal Products

1929	1,557	1,306	79	2,784
1939	1,920	1,647	115	3,452
1944	4,054	2,697	214	6,537
1947	3,753	3,246	501	6,498
1950	4,721	3,859	535	8,045
1951	5,150	4,211	648	8,713
1952	5,622	4,122	635	9,109
1953	5,615	4,449	640	9,424

Rubber Products

1929	882	408	3	1,287
1939	1,081	508	5	1,584
1944	1,752	833	91	2,494
1947	2,650	810	15	3,445
1950	3,008	785	16	3,777
1951	3,149	731	14	3,866
1952	3,152	689	13	3,828
1953	3,136	737	15	3,858

Leather and Leather Products

1929	227	122	14	335
1939	287	136	21	402
1944	454	119	17	556
1947	475	117	19	573
1950	592	102	20	674
1951	627	89	14	702
1952	664	91	15	740
1953	668	85	13	740

Stone, Clay and Glass Products

1929	2,242	1,124	23	3,343
1939	2,941	1,589	34	4,496
1944	3,785	1,486	132	5,139
1947	5,865	2,155	122	7,898
1950	7,715	2,353	130	9,938
1951	8,667	2,519	141	11,045
1952	8,703	2,412	135	10,980
1953	8,184	2,480	138	10,526

Primary Metal Industries

1929	9,621	5,063	1,141	13,543
1939	11,728	7,571	1,667	17,632
1944	33,789	11,193	1,824	43,158
1947	31,428	11,851	2,634	40,645
1950	38,818	14,110	2,817	50,111
1951	42,893	14,915	3,311	54,497
1952	42,341	15,619	3,467	54,493
1953	44,498	20,723	3,510	61,711

Fabricated Metal Products

	Purchased	Generated	Sold†	Utilized
		(Millions of Kwhr)		
1929	1,255	141	10	1,386
1939	1,547	192	14	1,725
1944	3,800	175	7	3,968
1947	3,739	170	8	3,901
1950	4,793	135	9	4,919
1951	5,591	128	6	5,713
1952	5,527	119	6	5,640
1953	6,573	117	5	6,685

Machinery (Except Electrical)

1929	1,404	273	8	1,669
1939	1,731	373	11	2,093
1944	5,249	675	62	5,862
1947	5,401	579	59	5,921
1950	6,034	520	63	6,491
1951	7,422	770	78	8,114
1952	7,735	739	75	8,399
1953	8,575	735	74	9,236

Electrical Machinery

1929	880	333	38	1,175
1939	993	467	55	1,405
1944	2,838	910	90	3,658
1947	3,156	574	114	3,616
1950	3,888	798	121	4,565
1951	4,487	753	149	5,091
1952	5,018	753	149	5,622
1953	5,444	767	151	6,060

Transportation Equipment

1929	847	635	64	1,418
1939	1,046	864	94	1,816
1944	7,944	1,759	243	9,460
1947	5,552	1,497	988	6,061
1950	6,991	1,714	1,050	7,655
1951	8,134	1,586	1,045	8,675
1952	9,599	1,599	1,054	10,144
1953	11,300	1,645	1,060	11,885

Instruments and Related Products

1929	116	78	24	170
1939	145	105	35	215
1944	460	120	2	578
1947	456	90	1	545
1950	579	230	3	806
1951	662	256	3	915
1952	755	266	3	1,018
1953	811	288	4	1,095

Miscellaneous Manufactures

1929	262	69	6	325
1939	321	95	9	407
1944	500	110	2	608
1947	1,043	101	30	1,114
1950	1,568	107	32	1,643
1951	2,115	107	32	2,190
1952	2,648	95	28	2,715
1953	2,719	95	28	2,786

Based on data published by the Bureau of the Census, Department of Commerce, Atomic Energy Commission and the Federal Power Commission with adjustments for comparability with 1947 classification.

†Data for 1950-1953 estimate based on partial coverage indicating that relation of sales to generation has not changed significantly.
*Revised.
‡Excluded from generation.

New Capacity Additions

Reported to Electrical World—Kw

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
New England								
Power Companies								
Bangor Hydro-Electric	Hydro	42,047		1,600				1,600
	Steam	11,500				22,000		22,000
	IC	18,000						
	Total	71,547		1,600		22,000		23,600
Boston Edison	Hydro	50						
	Steam	801,360			140,000			140,000
	Total	801,410			140,000			140,000
Central Maine Power	Hydro	264,479	27,400	4,000				4,000
	Steam	188,000	33,000		44,000	44,000		88,000
	IC	6,751						
	Total	459,230	60,400	4,000	44,000	44,000		92,000
Central Vermont Public Service	Hydro	40,757			5,000			5,000
	Steam	4,500						
	IC	20,500						
	Total	65,757			5,000			5,000
Citizens Utilities	Hydro	5,000		1,600				1,600
	Steam							
	IC	6,980						
	Total	11,980		1,600				1,600
Connecticut L&P	Hydro	111,970	47,000					
	Steam	448,000		105,000		105,000		210,000
	IC	24,000						
	Total	583,970	47,000	105,000		105,000		210,000
Hartford Electric Light	Steam	322,000				100,000		100,000
Lynn G & E	Steam	59,980					20,000	20,000
Maine Public Service	Hydro	2,300						
	Steam	20,150	12,650					
	IC	9,100						
	Total	31,550	12,650					
Montaup Electric	Steam	190,000					60,000	60,000
New England Electric System	Hydro	330,080		150,000				150,000
	Steam	683,320				140,000		140,000
	IC	10,000						
	Total	1,023,400		150,000		140,000		290,000
Public Service of New Hampshire	Hydro	74,650						
	Steam	213,250	50,000		50,000			50,000
	IC	3,000						
	Total	290,900	50,000		50,000			50,000
United Illuminating	Steam	333,000		2,000	82,000			84,000
Western Massachusetts Electric	Hydro	99,800						
	Steam	175,100			100,000			100,000
	Total	274,900			100,000			100,000
Total	**Hydro**	**971,133**	**74,400**	**157,200**	**5,000**			**162,200**
	Steam	**3,450,160**	**95,650**	**107,000**	**416,000**	**411,000**	**80,000**	**1,014,000**
	IC	**98,331**						
	Total	**4,519,624**	**170,050**	**264,200**	**421,000**	**411,000**	**80,000**	**1,176,200**
Municipal, State and Power District Systems								
Holyoke, Mass.	Hydro	2,330						
	Steam	30,000	2,000				5,000	5,000
	Total	32,330	2,000				5,000	5,000
Norwich, Conn.	Hydro	1,600					1,000	1,000
	Steam	14,250						
	IC					5,000		5,000
	Total	15,850				5,000	1,000	6,000
Wallingford, Conn.	Steam	22,500				16,500	16,500	33,000
	IC							
	Total	22,500				16,500	16,500	33,000
Total	**Hydro**	**3,930**					**1,000**	**1,000**
	Steam	**66,750**	**2,000**			**16,500**	**21,500**	**38,000**
	IC					**5,000**		**5,000**
	Total	**70,680**	**2,000**			**21,500**	**22,500**	**44,000**
New England	**Hydro**	**975,063**	**74,400**	**157,200**	**5,000**		**1,000**	**163,200**
Total All Agencies	**Steam**	**3,516,910**	**97,650**	**107,000**	**416,000**	**427,500**	**101,500**	**1,052,000**
	IC	**98,331**				**5,000**		**5,000**
	Total	**4,590,304**	**172,050**	**264,200**	**421,000**	**432,500**	**102,500**	**1,220,200**

Middle Atlantic

Power Companies	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Atlantic City Electric	Steam	318,000	.....	.....	25,000	75,000	.....	100,000
Central Hudson G & E	Hydro	47,020	.....	.....	.....	.....	.....	.....
	Steam	132,000	.....	.....	.....	.....	125,000	125,000
	Total	179,020	.....	.....	.....	.....	125,000	125,000
Consolidated Edison	Steam	3,736,000	179,000	.....	.....	350,000	600,000	950,000
Duquesne Light	Steam	1,014,000	.....	150,000	60,000	180,000	.....	390,000
Jersey Central P & L	Steam	381,224	137,500	.....	.....	.....	137,500	137,500
Long Island Lighting	Steam	617,600	.....	170,000	.....	.....	170,000	340,000
Metropolitan Edison	Hydro	20,620	.....	.....	.....	.....	.....	.....
	Steam	481,500	.....	.....	.....	165,000	.....	165,000
	Total	502,120	.....	.....	.....	165,000	.....	165,000
New York State E & G	Hydro	41,005	.....	6,000	.....	.....	.....	6,000
	Steam	619,750	152,000	.....	.....	.....	.....	.....
	IC	2,968	.....	.....	.....	.....	.....	.....
	Total	663,723	152,000	6,000	.....	.....	.....	6,000
Niagara Mohawk Power	Hydro	1,089,900	23,000	22,000	36,000	.....	.....	58,000
	Steam	1,900,000	.....	.....	200,000	.....	.....	200,000
	Total	2,989,900	23,000	22,000	236,000	.....	.....	258,000
Pennsylvania Electric	Hydro	52,100	.....	.....	.....	.....	.....	.....
	Steam	746,862	.....	.....	137,500	.....	.....	137,500
	Total	798,962	.....	.....	137,500	.....	.....	137,500
Pennsylvania Power	Steam	155,000	.....	.....	.....	90,000	.....	90,000
Pennsylvania P & L	Hydro	151,600	.....	.....	.....	.....	.....	.....
	Steam	1,071,950	.....	132,500	.....	.....	150,000	282,500
	Total	1,223,550	.....	132,500	.....	.....	150,000	282,500
Philadelphia Electric	Hydro	252,000	.....	.....	.....	.....	.....	.....
	Steam	2,096,250	236,000	.....	.....	175,000	650,000	825,000
	Total	2,348,250	236,000	.....	.....	175,000	650,000	825,000
Public Service E & G	Steam	2,066,300	185,000	.....	450,000	550,000	.....	1,000,000
Rochester G & E	Hydro	49,040	.....	.....	.....	.....	.....	.....
	Steam	293,100	.....	.....	.....	83,500	.....	83,500
	Total	342,140	.....	.....	.....	83,500	.....	83,500
Rockland L & P	Hydro	25,750	.....	18,000	.....	.....	.....	18,000
	Steam	124,275	70,000	.....	.....	.....	.....	.....
	Total	150,025	70,000	18,000	.....	.....	.....	18,000
West Penn Power	Hydro	52,000	.....	.....	.....	.....	.....	.....
	Steam	883,000	.....	.....	.....	170,000	.....	170,000
	Total	935,000	.....	.....	.....	170,000	.....	170,000

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Commonwealth Edison	Hydro	6,865	.....	.....	.....	.....	.....	.....
	Steam	3,898,500	354,000	21,000	295,000	505,000	180,000	1,001,000
	Total	3,905,365	354,000	21,000	295,000	505,000	180,000	1,001,000
Consumers Power	Hydro	152,870	.....	.....	.....	.....	.....	.....
	Steam	1,398,750	156,250	142,000	142,000	142,000	.....	426,000
	IC	6,498	.....	.....	.....	.....	.....	.....
	Total	1,558,118	156,250	142,000	142,000	142,000	.....	426,000
Cleveland Electric Illuminating	Steam	1,260,000	.....	240,000	.....	250,000	.....	490,000
Columbus & Southern Ohio Electric	Steam	560,000	100,000	.....	125,000	.....	125,000	250,000
Dayton P & L	Steam	510,000	.....	.....	130,000	.....	130,000	260,000
Detroit Edison	Hydro	7,850	.....	.....	.....	.....	.....	.....
	Steam	2,200,000	.....	520,000	300,000	.....	300,000	1,120,000
	Total	2,207,850	.....	520,000	300,000	.....	300,000	1,120,000
Edison Sault Electric	Steam	3,000	.....	.....	.....	.....	.....	.....
	IC	5,662	1,500	.....	.....	.....	.....	.....
	Total	8,662	1,500	.....	.....	.....	.....	.....
Electric Energy Inc.	Steam	937,500	312,500	.....	.....	.....	.....	.....
Illinois Power	Hydro	1,500	.....	.....	.....	.....	.....	.....
	Steam	700,500	75,000	100,000	.....	.....	.....	100,000
	IC	2,000	.....	.....	.....	.....	.....	.....
	Total	704,000	75,000	100,000	.....	.....	.....	100,000
Indiana-Kentucky Electric	Steam	900,000	900,000	180,000	.....	.....	.....	180,000
Indianapolis P & L	Steam	496,000	.....	105,000	.....	105,000	.....	210,000
Lake Superior District Power	Hydro	11,968	.....	.....	.....	.....	.....	.....
	Steam	55,000	.....	.....	12,000	.....	.....	12,000
	IC	4,000	.....	.....	.....	.....	.....	.....
	Total	70,968	.....	.....	12,000	.....	.....	12,000
Madison G & E	Steam	85,000	.....	.....	44,000	.....	.....	44,000
Mt. Carmel Public Utility	Steam	14,500	.....	.....	7,500	.....	.....	7,500
Northern Indiana Public Service	Hydro	19,005	.....	.....	.....	.....	.....	.....
	Steam	208,030	.....	137,500	.....	.....	.....	137,500
	Total	227,035	.....	137,500	.....	.....	.....	137,500
Northern States Power	Hydro	123,755	.....	.....	.....	4,200	.....	4,200
	Steam	54,500	.....	.....	.....	.....	.....	.....
	IC	3,100	.....	.....	.....	.....	.....	.....
	Total	181,355	.....	.....	.....	4,200	.....	4,200
Ohio Edison	Hydro	1,950	.....	.....	.....	.....	.....	.....
	Steam	1,450,350	270,000	.....	90,000	.....	340,000	430,000
	Total	1,452,300	270,000	.....	90,000	.....	340,000	430,000
Ohio Edison & Pennsylvania Power	Hydro	3,900	.....	.....	.....	.....	.....	.....
	Steam	3,055,700	270,000	.....	90,000	90,000	340,000	520,000
	Total	3,059,600	270,000	.....	90,000	90,000	340,000	520,000

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Total	**Hydro**	**1,781,035**	**23,000**	**46,000**	**36,000**	.....	.....	**82,000**
	Steam	**16,636,811**	**959,500**	**452,500**	**872,500**	**1,838,500**	**1,832,500**	**4,996,000**
	IC	**2,968**	.....	.....	.....	.....	.....	.....
	Total	**18,420,814**	**982,500**	**498,500**	**908,500**	**1,838,500**	**1,832,500**	**5,078,000**
Municipal, State and Power District Systems								
Vineland, N.J.	Steam	36,000	12,500	.....	.....	.....	20,000	20,000
N.Y. State Power Authority	Hydro	.....	.....	.....	.....	456,000	456,000	912,000
Rockville Centre, N.Y.	IC	15,420	.....	.....	3,500	.....	3,500	7,000
Chambersburg, Pa.	Steam	10,000	.....	5,000	.....	.....	.....	5,000
Grove City, Pa.	IC	4,795	.....	1,500	.....	.....	.....	1,500
Hatfield, Pa.	IC	1,010	.....	675	.....	.....	.....	675
Quakertown, Pa.	Steam	6,000	.....	.....	.....	.....	.....	.....
	IC	1,100	.....	1,500	.....	.....	1,500	3,000
	Total	7,100	.....	.....	.....	.....	.....	.....
Total	**Hydro**	.....	.....	.....	.....	**456,000**	**456,000**	**912,000**
	Steam	**52,000**	**12,500**	**5,000**	.....	.....	**20,000**	**25,000**
	IC	**22,325**	.....	**3,675**	**3,500**	.....	**5,000**	**12,175**
	Total	**74,325**	**12,500**	**8,675**	**3,500**	**456,000**	**481,000**	**949,175**
Middle Atlantic	**Hydro**	**1,781,035**	**23,000**	**46,000**	**36,000**	**456,000**	**456,000**	**994,000**
Total All Agencies	**Steam**	**16,688,811**	**972,000**	**457,500**	**872,500**	**1,838,500**	**1,852,500**	**5,021,000**
	IC	**25,293**	.....	**3,675**	**3,500**	.....	**5,000**	**12,175**
	Total	**18,495,139**	**995,000**	**507,175**	**912,000**	**2,294,500**	**2,313,500**	**6,027,175**

East North Central

Power Companies								
Central Illinois E & G	Hydro	1,200	.....	.....	.....	.....	.....	.....
	Steam	161,750	30,000	.....	.....	.....	30,000	30,000
	IC	750	.....	.....	.....	.....	.....	.....
	Total	163,700	30,000	.....	.....	.....	30,000	30,000
Central Illinois Light	Steam	233,900	.....	.....	100,000	.....	125,000	225,000
Central Illinois Public Service	Steam	380,000	.....	.....	100,000	.....	.....	100,000
Cincinnati G & E	Steam	895,000	.....	.....	172,000	.....	.....	172,000
Ohio Power	Hydro	3,000	.....	.....	.....	.....	.....	.....
	Steam	1,364,000	.....	450,000	225,000	.....	.....	675,000
	Total	1,367,000	.....	450,000	225,000	.....	.....	675,000
Ohio Valley Electric	Steam	900,000	900,000	.....	.....	.....	.....	.....
Public Service Company of Indiana	Hydro	3,200	.....	.....	.....	.....	.....	.....
	Steam	866,000	99,000	125,000	.....	150,000	150,000	425,000
	Total	869,200	99,000	125,000	.....	150,000	150,000	425,000
Upper Peninsula Generating	Hydro	14,200	.....	.....	.....	.....	.....	.....
	Steam	27,500	22,000	.....	.....	.....	.....	.....
	IC	19,700	.....	.....	.....	.....	.....	.....
	Total	61,400	.....	.....	.....	.....	.....	.....
Southern Indiana G & E	Steam	161,500	45,100	.....	.....	.....	.....	.....
Toledo Edison	Hydro	5,000	.....	.....	.....	.....	.....	.....
	Steam	454,000	135,000	.....	.....	135,000	.....	135,000
	Total	459,000	135,000	.....	.....	135,000	.....	135,000
Wisconsin Electric Power	Hydro	415	.....	.....	.....	.....	.....	.....
	Steam	1,194,500	120,000	.....	120,000	.....	.....	120,000
	Total	1,194,915	120,000	.....	120,000	.....	.....	120,000
Wisconsin P & L	Hydro	42,200	.....	.....	.....	.....	.....	.....
	Steam	325,000	75,000	.....	.....	100,000	100,000	200,000
	Total	367,200	75,000	.....	.....	100,000	100,000	200,000
Wisconsin Public Service	Hydro	63,296	.....	.....	.....	.....	.....	.....
	Steam	272,250	.....	.....	.....	80,000	.....	80,000
	IC	3,000	.....	.....	.....	.....	.....	.....
	Total	338,546	.....	.....	.....	80,000	.....	80,000
Total	**Hydro**	**462,174**	.....	.....	.....	**4,200**	.....	**4,200**
	Steam	**25,022,730**	**3,863,850**	**2,020,500**	**1,952,500**	**1,557,000**	**1,820,000**	**7,350,000**
	IC	**44,710**	**1,500**	.....	.....	.....	.....	.....
	Total	**25,529,614**	**3,865,350**	**2,020,500**	**1,952,500**	**1,561,200**	**1,820,000**	**7,354,200**
Municipal, State and Power District Systems								
Fairfield, Ill.	Steam	9,375	.....	6,250	.....	.....	.....	6,250
Rantoul, Ill.	IC	4,932	.....	1,500	.....	.....	.....	1,500
Salem, Ill.	Steam	4,625	.....	.....	2,500	.....	.....	2,500
	IC	.....	.....	.....	2,000	.....	.....	2,000
	Total	4,625	.....	.....	4,500	.....	.....	4,500
Springfield, Ill.	Steam	80,000	.....	.....	.....	.....	40,000	40,000
Winnetka, Ill.	Steam	15,500	.....	.....	.....	.....	12,500	12,500
Woodstock, Ill.	Steam	14,000	.....	.....	.....	.....	.....	.....
	IC	2,600	2,600	.....	.....	.....	.....	.....
	Total	16,600	2,600	.....	.....	.....	.....	.....

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Crawfordsville, Ind.	Steam	16,000	12,650					
Logansport, Ind.	Steam	17,500			16,500			16,500
Richmond, Ind.	Steam	75,000	30,000				30,000	30,000
Washington, Ind.	Steam	10,000		10,000				10,000
Coldwater, Mich.	Steam	5,500					6,000	6,000
	IC	2,000						
	Total	7,500					6,000	6,000
Detroit, Mich	Steam	120,000			50,000			50,000
Hart, Mich.	Hydro	300						
	IC	1,943			2,000			2,000
	Total	2,243			2,000			2,000
Holland, Mich.	Steam	31,500				15,000		15,000
Kalamazoo, Mich.	Steam	7,000		9,375				9,375
Lansing, Mich.	Hydro	1,200						
	Steam	181,750				44,000		44,000
	Total	182,950				44,000		44,000
Petoskey, Mich.	Hydro	870						
	IC	4,250			1,250		1,250	2,500
	Total	5,120			1,250		1,250	2,500
South Haven, Mich.	Steam	10,000		7,500				7,500
Wyandotte, Mich.	Steam	23,500				22,500		22,500
Zeeland, Mich.	IC	4,486		2,000				2,000
Celina, Ohio	Steam	5,500			6,000			6,000
Cleveland, Ohio	Steam	137,500				50,000		50,000
	IC			1,500				1,500
	Total	137,500		1,500		50,000		51,500
Columbus, Ohio	Steam	33,000	15,625					
Deshler, Ohio	IC	2,316				1,100		1,100
Dover, Ohio	Steam	15,750	7,500				10,000	10,000
East Palestine, Ohio	Steam	5,000		6,250				6,250
Greenfield, Ohio	Steam	3,550		2,000				2,000
Hamilton, Ohio	Steam	10,500	10,500			22,000		22,000
Napoleon, Ohio	Steam	5,000		7,500				7,500
Orrville, Ohio	Steam	16,500	7,500				7,500	7,500
Painsville, Ohio	Steam	21,500	7,500					
Shelby, Ohio	Steam	17,000	9,375					

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Central E & G	Hydro	200						
	IC	6,335			1,500			1,500
	Total	6,535			1,500			1,500
Central Kansas Power	Steam	36,250	6,250	7,500				7,500
	IC	5,600						
	Total	41,850	6,250	7,500				7,500
Empire District Electric	Hydro	19,425						
	Steam	137,500					44,000	44,000
	IC	2,276						
	Total	159,201					44,000	44,000
Interstate Power	Hydro	4,922						
	Steam	135,750			33,000			33,000
	IC	4,035						
	Total	144,707			33,000			33,000
Iowa EL & P	Hydro	4,053						
	Steam	240,625	66,000			44,000		44,000
	IC	48,687	1,000	1,000				1,000
	Total	293,365	67,000	1,000		44,000		45,000
Iowa-Illinois G & E	Hydro	4,000						
	Steam	240,079	25,000				75,000	75,000
	IC	1,148						
	Total	245,227	25,000				75,000	75,000
Iowa P & L	Hydro	400						
	Steam	269,750					79,600	79,600
	IC	10,348						
	Total	280,498					79,600	79,600
Iowa Public Service	Hydro	2,051						
	Steam	163,800					44,000	44,000
	IC	25,225						
	Total	191,076					44,000	44,000
Iowa Southern Utilities	Steam	74,550			22,000			22,000
	IC	5,000						
	Total	79,550			22,000			22,000
Kansas City P & L	Steam	659,750	109,000			175,000	175,000	350,000
Kansas G & E	Steam	323,000		115,000		115,000		230,000
Kansas P & L	Hydro	1,060						
	Steam	336,250	33,000		92,000			92,000
	IC	2,958						
	Total	340,268	33,000		92,000			92,000
Minnesota P & L	Hydro	106,940						
	Steam	240,500					65,000	65,000
	Total	347,440					65,000	65,000
Missouri Public Service	Hydro	1,600						
	Steam	50,000			22,000			22,000
	IC	4,913						
	Total	56,513			22,000			22,000

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
St. Marys, Ohio	Steam	650	.....	.....	7,500	.....	.....	7,500
Manitowoc, Wis.	Steam	30,000	.....	22,000	.....	.....	.....	22,000
Menasha, Wis.	Steam	15,500	7,500	.....	.....	.....	10,000	10,000
	IC	1,600	.....	.....	.....	.....	.....	.....
	Total	17,100	7,500	.....	.....	.....	10,000	10,000
Total	**Hydro**	**2,370**	.....	.....	.....	.....	.....	.....
	Steam	**938,200**	**108,150**	**70,875**	**82,500**	**153,500**	**116,000**	**422,875**
	IC	**24,127**	**2,600**	**5,000**	**5,250**	**1,100**	**1,250**	**12,600**
	Total	**964,697**	**110,750**	**75,875**	**87,750**	**154,600**	**117,250**	**435,475**
Cooperatives								
Dairyland Power	Hydro	21,600	.....	.....	.....	.....	.....	.....
	Steam	117,500	.....	50,000	.....	.....	.....	50,000
	IC	13,900	.....	.....	.....	.....	.....	.....
	Total	153,000	.....	50,000	.....	.....	.....	50,000
Washington Island Electric	Hydro	570	.....	.....	.....	.....	.....	.....
	IC	570	.....	.....	.....	.....	300	300
	Total	1,140	.....	.....	.....	.....	.....	.....
Western Michigan Electric	IC	3,220	.....	.....	2,000	.....	.....	2,000
Wolverine Electric	IC	18,397	.....	2,500	2,500	.....	.....	5,000
Total	**Hydro**	**22,170**	.....	.....	.....	.....	.....	.....
	Steam	**117,500**	.....	**50,000**	.....	.....	.....	**50,000**
	IC	**36,087**	.....	**2,500**	**4,500**	.....	**300**	**7,300**
	Total	**175,757**	.....	**52,500**	**4,500**	.....	**300**	**57,300**
East North Central	**Hydro**	**486,714**	.....	.....	.....	**4,200**	.....	**4,200**
Total All Agencies	**Steam**	**26,078,430**	**3,972,000**	**2,141,375**	**2,035,000**	**1,710,500**	**1,936,000**	**7,822,875**
	IC	**104,924**	**4,100**	**7,500**	**9,750**	**1,100**	**1,550**	**19,900**
	Total	**26,670,068**	**3,976,100**	**2,148,875**	**2,044,750**	**1,715,800**	**1,937,550**	**7,846,975**

West North Central

Power Companies								
Black Hills P & L	Hydro	1,346	.....	.....	.....	.....	.....	.....
	Steam	64,000	.....	16,500	.....	.....	.....	16,500
	IC	8,513	.....	.....	.....	.....	.....	.....
	Total	73,859	.....	16,500	.....	.....	.....	16,500
Northern States Power (Minn.)	Hydro	64,445	4,975	.....	.....	.....	.....	.....
	Steam	962,300	100,000	100,000	.....	.....	.....	100,000
	IC	30,415	.....	.....	.....	.....	.....	.....
	Total	1,057,160	104,975	100,000	.....	.....	.....	100,000
Northwestern Public Service	Steam	29,300	.....	.....	.....	.....	.....	.....
	IC	15,924	500	.....	.....	.....	.....	.....
	Total	45,224	500	.....	.....	.....	.....	.....
Otter Tail Power	Hydro	5,755	.....	.....	.....	.....	.....	.....
	Steam	94,000	.....	.....	.....	.....	50,000	50,000
	IC	23,845	.....	.....	.....	.....	.....	.....
	Total	123,600	.....	.....	.....	.....	50,000	50,000
St. Joseph L & P	Steam	64,340	.....	2,500	25,000	.....	33,000	60,500
	IC	2,205	.....	.....	.....	.....	.....	.....
	Total	66,545	.....	2,500	25,000	.....	33,000	60,500
Union Electric Co. of Missouri	Hydro	293,600	.....	.....	.....	.....	.....	.....
	Steam	1,230,000	.....	.....	.....	250,000	250,000	500,000
	Total	1,523,600	.....	.....	.....	250,000	250,000	500,000
Western Light & Telephone	Steam	90,416	16,500	.....	.....	.....	.....	.....
	IC	31,735	.....	.....	.....	.....	.....	.....
	Total	122,151	16,500	.....	.....	.....	.....	.....
Total	**Hydro**	**509,797**	**4,975**	.....	.....	.....	.....	.....
	Steam	**5,442,160**	**355,750**	**241,500**	**194,000**	**584,000**	**815,600**	**1,835,100**
	IC	**229,162**	**1,500**	**1,000**	**1,500**	.....	.....	**2,500**
	Total	**6,181,119**	**362,225**	**242,500**	**195,500**	**584,000**	**815,600**	**1,837,600**
Municipal, State and Power District Systems								
Ames, Iowa	Steam	15,500	.....	.....	.....	.....	12,500	12,500
	IC	1,000	.....	.....	.....	.....	.....	.....
	Total	16,500	.....	.....	.....	.....	12,500	12,500
Atlantic, Iowa	Steam	6,250	.....	5,000	.....	.....	.....	5,000
Cedar Falls, Iowa	Hydro	1,200	.....	.....	.....	.....	.....	.....
	Steam	15,250	.....	.....	.....	.....	.....	.....
	IC	1,375	.....	.....	.....	.....	.....	.....
	Total	17,825	.....	.....	.....	.....	.....	.....
Forest City, Iowa	IC	2,965	1,250	.....	.....	.....	.....	.....
Independence, Iowa	IC	3,250	.....	2,500	.....	.....	5,000	7,500
Lenox, Iowa	IC	943	.....	.....	700	.....	.....	700
Spencer, Iowa	Steam	10,000	.....	.....	.....	.....	10,000	10,000
Sumner, Iowa	IC	1,905	.....	1,360	.....	.....	1,500	2,860
Chanute, Kan.	Steam	8,000	.....	9,375	.....	.....	.....	9,375
Coffeyville, Kan.	Steam	21,500	.....	15,000	.....	.....	.....	15,000

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Holsington, Kan.	IC	1,400	1,400	.....	.....	.....	.....	.....
Iola, Kan.	Steam	7,000	.....	.....	5,000	.....	.....	5,000
Kansas City, Kan.	Steam	169,000	40,000	40,000	.....	.....	66,000	106,000
McPherson, Kan.	Steam	15,500	.....	11,000	.....	.....	.....	11,000
	IC	1,200	.....	.....	.....	.....	.....	.....
	Total	16,700	.....	11,000	.....	.....	.....	11,000
Meade, Kan.	IC	1,772	.....	150	.....	.....	.....	150
Neodesha, Kan.	IC	3,360	.....	.....	2,000	.....	.....	2,000
Osage City, Kan.	IC	2,579	908	.....	.....	.....	.....	.....
Russell, Kan.	IC	3,425	3,425	.....	.....	.....	.....	.....
Wellington, Kansas	Steam	16,875	9,375	.....	.....	.....	.....	.....
Winfield, Kan.	Steam	8,050	.....	.....	10,000	.....	.....	10,000
Elk River, Minn.	IC	.....	.....	.....	2,000	.....	.....	2,000
Grand Marais, Minn.	IC	1,107	.....	583	.....	1,200	.....	1,783
Kenyon, Minn.	IC	1,921	.....	1,500	.....	.....	.....	1,500
Le Seur, Minn.	IC	3,793	.....	.....	.....	2,500	.....	2,500
Litchfield, Minn.	Steam	3,750	.....	.....	.....	.....	6,000	6,000
	IC	4,000	.....	.....	.....	.....	.....	.....
	Total	7,750	.....	.....	.....	.....	6,000	6,000
Mazeppa, Minn.	IC	520	.....	600	.....	.....	.....	600
New Ulm, Minn.	Steam	.....	.....	4,750	.....	.....	.....	4,750
Owatonna, Minn.	Steam	8,500	.....	6,000	.....	.....	.....	6,000
Sleepy Eye, Minn.	Steam	3,200	.....	1,500	.....	.....	.....	1,500
	IC	625	.....	.....	.....	.....	.....	.....
	Total	3,825	.....	1,500	.....	.....	.....	1,500
Springfield, Minn.	Steam	3,750	3,750	.....	.....	.....	.....	.....
Virginia, Minn.	Steam	17,500	8,800	.....	.....	.....	11,750	11,750
Wells, Minn.	IC	3,876	.....	.....	1,360	.....	.....	1,360
Willmar, Minn.	Steam	15,250	7,500	.....	.....	.....	.....	.....
Columbia, Mo.	Steam	18,500	.....	16,500	.....	.....	33,000	49,500
Harrisonville, Mo.	IC	2,210	.....	1,000	.....	.....	.....	1,000
Independence, Mo.	Steam	13,750	6,250	.....	.....	.....	.....	.....
Kennett, Mo.	IC	2,500	2,500	.....	.....	.....	.....	.....
Marshall, Mo.	Steam	8,000	.....	6,000	.....	.....	.....	6,000
Pleasant Hill, Mo.	IC	1,000	1,000	.....	.....	.....	1,200	1,200
SW Federated Power	Steam	1,500	.....	9,375	.....	.....	.....	9,375
	IC	8,196	.....	.....	.....	.....	.....	.....
	Total	9,696	.....	9,375	.....	.....	.....	9,375
Wheatland Electric	IC	11,092	300	2,345	2,345	.....	7,035	11,725
Total	**Steam**	**95,530**	.....	**25,875**	.....	**44,000**	**61,000**	**130,875**
	IC	**48,983**	**300**	**2,345**	**4,965**	.....	**7,035**	**14,345**
	Total	**145,513**	**300**	**28,220**	**4,965**	**44,000**	**68,035**	**145,220**
Federal Agencies								
Corps of Engineers	**Hydro**	**280,000**	**120,000**	**313,333**	**66,666**	.....	**585,000**	**964,999**
West North Central	**Hydro**	**529,953**	**124,975**	**313,333**	**66,666**	.....	**585,000**	**964,999**
Total All Agencies	**Steam**	**6,446,596**	**440,800**	**399,000**	**371,500**	**760,000**	**1,290,850**	**2,821,350**
	IC	**359,649**	**14,783**	**16,838**	**15,025**	**3,700**	**14,735**	**50,298**
	Total	**7,736,198**	**580,558**	**729,171**	**453,191**	**763,700**	**1,890,585**	**3,836,647**

South Atlantic

Power Companies								
Baltimore G & E	Steam	830,500	.....	125,000	.....	.....	125,000	250,000
Carolina P & L	Hydro	205,100	.....	.....	.....	.....	.....	.....
	Steam	584,500	102,000	140,000	.....	178,000	.....	318,000
	Total	789,600	102,000	140,000	.....	178,000	.....	318,000
Delaware P & L	Steam	223,600	.....	.....	125,000	.....	.....	125,000
Duke Power	Hydro	497,273	.....	.....	.....	.....	.....	.....
	Steam	1,839,000	150,000	.....	330,000	.....	.....	330,000
	IC	500	.....	.....	.....	.....	.....	.....
	Total	2,336,773	150,000	.....	330,000	.....	.....	330,000
Florida Power Corp.	Hydro	12,493	.....	.....	.....	.....	.....	.....
	Steam	436,000	70,000	70,000	120,000	.....	.....	190,000
	IC	5,228	.....	.....	.....	.....	.....	.....
	Total	453,721	70,000	70,000	120,000	.....	.....	190,000
Florida P & L	Steam	882,000	150,000	80,000	160,000	160,000	160,000	560,000
	IC	10,000	.....	.....	.....	.....	.....	.....
	Total	892,000	150,000	80,000	160,000	160,000	160,000	560,000
Georgia Power	Hydro	360,930	10,000	.....	.....	.....	60,000	60,000
	Steam	1,095,000	98,500	.....	125,000	125,000	.....	250,000
	Total	1,455,930	108,500	.....	125,000	125,000	60,000	310,000
Gulf Power Co.	Steam	155,000	.....	.....	.....	.....	75,000	75,000
Monongahela Power	Steam	430,325	10,000	.....	.....	.....	.....	.....
	IC	3,798	210	.....	.....	.....	.....	.....
	Total	434,123	10,210	.....	.....	.....	.....	.....
Nantahala P & L	Hydro	99,235	10,800	.....	.....	36,000	.....	36,000

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Springfield, Mo.	Steam	23,900			22,000	22,000		44,000
Central Nebraska Public Power & Irrigation District	Steam						100,000	100,000
Consumers Public Power District	Hydro	9,115						
	Steam	26,875	9,375				75,000	75,000
	IC	17,560						
	Total	53,550	9,375				75,000	75,000
Fairbury, Neb.	Hydro	240						
	Steam	8,500			7,500			7,500
	IC			600				600
	Total	8,740		600	7,500			8,100
Fremont, Neb.	Steam	21,000			16,500			16,500
Grand Island, Neb.	Steam	12,000		16,500				16,500
Hastings, Neb.	Steam	17,500			16,500			16,500
Nebraska City, Neb.	Steam	2,500						
	IC	5,500	2,500		2,500			2,500
	Total	8,000	2,500		2,500			2,500
Nebraska Public Power System	Hydro	129,601						
	Steam	146,500				100,000		100,000
	IC	2,976						
	Total	279,077				100,000		100,000
Omaha Public Power District	Steam	264,000			100,000		100,000	200,000
Sidney, Neb.	IC	5,507		3,200				3,200
Wayne, Neb.	IC	3,235		2,000				2,000
Watertown, S.D.	Steam					10,000		10,000
Total	**Hydro**	**140,156**						
	Steam	**987,900**	**85,050**	**131,625**	**177,500**	**132,000**	**414,250**	**855,375**
	IC	**81,504**	**12,983**	**13,493**	**8,560**	**3,700**	**7,700**	**33,453**
	Total	**1,129,560**	**98,033**	**145,118**	**186,060**	**135,700**	**421,950**	**888,828**
Cooperatives								
AGRA LITE	IC	6,525			2,620			2,620
Central Iowa Power	Steam	44,000				44,000		44,000
Minnkota Power	Steam	26,030					50,000	50,000
	IC	15,730						
	Total	41,760					50,000	50,000
Northeast Missouri Electric Power	Steam	15,000					11,000	11,000
	IC	7,440						
	Total	22,440					11,000	11,000
Rushmore Generating & Transmission	Steam	10,000		16,500				16,500
Potomac Edison	Hydro	12,150						
	Steam	286,300					75,000	75,000
	Total	298,450					75,000	75,000
Potomac Electric Power	Steam	780,000		100,000	100,000		150,000	350,000
Savannah Electric & Power	Steam	75,500		40,000				40,000
South Carolina E & G	Hydro	174,360						
	Steam	426,500	100,000				125,000	125,000
	IC	150						
	Total	601,010	100,000				125,000	125,000
Tampa Electric	Steam	253,500	75,000		120,000	120,000		240,000
Virginia Electric & Power	Hydro	138,039	100,000				87,000	87,000
	Steam	1,011,250	103,000		160,000	160,000		320,000
	IC	1,200						
	Total	1,150,489	203,000		160,000	160,000	87,000	407,000
Total	**Hydro**	**1,499,580**	**120,800**			**36,000**	**147,000**	**183,000**
	Steam	**9,388,975**	**858,500**	**555,000**	**1,240,000**	**943,000**	**635,000**	**3,373,000**
	IC	**20,876**	**210**					
	Total	**10,829,431**	**979,510**	**555,000**	**1,240,000**	**979,000**	**782,000**	**3,556,000**
Municipal, State and Power District Systems								
Dover, Del.	Steam	10,750	6,250					
Gainsville, Fla.	Steam	21,650	12,650					
	IC	1,160						
	Total	22,810	12,650					
Jacksonville, Fla.	Steam	247,500	88,000		44,000		66,000	110,000
Lakeland, Fla.	Steam	32,500		25,000				25,000
Orlando, Fla.	Steam	70,000		33,000				33,000
St. Cloud, Fla.	IC	4,100	1,700					
Tallahassee, Fla.	Steam	22,500			22,000			22,000
Crisp County, Ga.	Hydro	15,000		5,000				5,000
	Steam				15,000			15,000
	Total	15,000		5,000	15,000			20,000
Hagerstown, Md.	Steam	13,800			12,500			12,500
Kingston, N.C.	Steam	30,150	12,650					
Danville, Va.	Hydro	10,125						
	Steam	29,000					15,000	15,000
	Total	39,125					15,000	15,000
Total	**Hydro**	**25,125**		**5,000**				**5,000**
	Steam	**477,850**	**11,955**	**58,000**	**93,500**		**81,000**	**232,500**
	IC	**5,260**	**1,700**					
	Total	**508,235**	**13,655**	**63,000**	**93,500**		**81,000**	**237,500**

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Federal Agencies								
Corps of Engineers	Hydro	572,000	.....	70,000	46,000	.....	330,000	446,000
Tennessee Valley Authority	Hydro	364,600	74,500	.....	.....	.....	.....	.....
Total	**Hydro**	**936,600**	**74,500**	**70,000**	**46,000**	.....	**330,000**	**446,000**
South Atlantic	**Hydro**	**2,461,305**	**195,300**	**75,000**	**46,000**	**36,000**	**477,000**	**634,000**
Total All Agencies	**Steam**	**9,786,825**	**870,455**	**613,000**	**1,333,500**	**943,000**	**716,000**	**3,605,500**
	IC	**26,136**	**1,910**	.....	.....	.....	.....	.....
	Total	**12,274,266**	**1,067,665**	**688,000**	**1,379,500**	**979,000**	**1,193,000**	**4,239,500**

East South Central

Power Companies								
Alabama Power	Hydro	489,700	.....	.....	.....	.....	.....	.....
	Steam	890,000	.....	167,400	.....	181,500	200,000	548,900
	Total	1,379,700	.....	167,400	.....	181,500	200,000	548,900
Appalachian Electric Power	Hydro	121,057	.....	.....	.....	.....	.....	.....
	Steam	1,178,640	.....	225,000	.....	.....	.....	225,000
	Total	1,299,697	.....	225,000	.....	.....	.....	225,000
Kentucky Utilities	Hydro	30,540	.....	.....	.....	.....	.....	.....
	Steam	333,750	.....	100,000	.....	.....	.....	100,000
	Total	364,290	.....	100,000	.....	.....	.....	100,000
Louisville G & E & Subsidiary	Hydro	80,320	.....	.....	.....	.....	.....	.....
	Steam	515,000	.....	100,000	.....	125,000	.....	225,000
	Total	595,320	.....	100,000	.....	125,000	.....	225,000
Mississippi Power	Steam	147,500	.....	.....	80,300	.....	.....	80,300
TAPOCO, Inc.	Hydro	.....	.....	.....	50,000	.....	.....	50,000
Total	**Hydro**	**721,617**	.....	.....	**50,000**	.....	.....	**50,000**
	Steam	**3,064,890**	.....	**592,400**	**80,300**	**306,500**	**200,000**	**1,179,200**
	IC	.....	.....	.....	.....	.....	.....	.....
	Total	**3,786,507**	.....	**592,400**	**130,300**	**306,500**	**200,000**	**1,229,200**
Municipal, State and Power District Systems								
Greenwood, Miss.	Steam	25,500	5,000	.....	.....	15,000	.....	15,000
Henderson, Ky.	Steam	10,000	.....	12,650	.....	.....	.....	12,650
	IC	2,460	.....	.....	.....	.....	.....	.....
	Total	12,460	.....	.....	.....	.....	.....	.....
Memphis, Tenn.	Steam	.....	.....	.....	.....	.....	600,000	600,000
Total	**Steam**	**35,500**	**5,000**	**12,650**	.....	**15,000**	**600,000**	**627,650**
	IC	**2,460**	.....	.....	.....	.....	.....	.....
	Total	**37,960**	**5,000**	**12,650**	.....	**15,000**	**600,000**	**627,650**

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Oklahoma G & E	Steam	491,496	110,000	170,000	.....	170,000	170,000	510,000
	IC	13,099	.....	.....	.....	.....	.....	.....
	Total	504,595	110,000	170,000	.....	170,000	170,000	510,000
Southwestern G & E	Steam	290,000	.....	87,000	114,000	.....	114,000	315,000
Southwestern Public Service	Hydro	410	.....	.....	.....	.....	.....	.....
	Steam	593,000	165,000	.....	75,000	.....	.....	75,000
	IC	13,649	.....	300	.....	.....	.....	300
	Total	607,059	165,000	300	75,000	.....	.....	75,300
Texas Electric Service	Steam	602,550	.....	.....	175,000	175,000	.....	350,000
	IC	11,948	.....	.....	.....	.....	.....	.....
	Total	614,498	.....	.....	175,000	175,000	.....	350,000
Texas P & L	Steam	447,300	145,000	.....	.....	156,250	.....	156,250
	IC	7,450	.....	.....	.....	.....	.....	.....
	Total	454,750	145,000	.....	.....	156,250	.....	156,250
West Texas Utilities	Steam	231,500	33,000	.....	.....	.....	33,000	33,000
	IC	21,470	1,000	.....	1,000	29,000	.....	30,000
	Total	252,970	34,000	.....	1,000	29,000	33,000	63,000
Total	**Hydro**	**15,410**	.....	.....	.....	.....	.....	.....
	Steam	**6,480,096**	**958,000**	**748,000**	**633,000**	**1,359,250**	**317,000**	**3,057,250**
	IC	**77,486**	**1,000**	**300**	**1,000**	**29,000**	.....	**30,300**
	Total	**6,572,992**	**959,000**	**748,300**	**634,000**	**1,388,250**	**317,000**	**3,087,550**
Municipal, State and Power District Systems								
Jonesboro, Ark.	Steam	22,500	.....	.....	15,000	.....	.....	15,000
Alexandria, La.	Steam	21,500	.....	.....	33,000	.....	.....	33,000
Houma, La.	IC	8,385	.....	2,555	.....	2,555	2,555	7,665
Lafayette, La.	Steam	8,000	.....	12,650	.....	.....	20,000	32,650
	IC	6,282	.....	.....	.....	.....	.....	.....
	Total	14,282	.....	12,650	.....	.....	20,000	32,650
Minden, La.	IC	7,377	2,500	.....	2,500	.....	.....	2,500
Monroe, La.	Steam	36,375	9,375	.....	.....	.....	.....	.....
Rayne, La.	IC	4,370	.....	.....	.....	.....	1,500	1,500
Grand River Dam Authority	Hydro	90,000	.....	.....	.....	.....	100,000	100,000
	Steam	45,000	.....	.....	30,000	.....	.....	30,000
	Total	135,000	.....	.....	30,000	.....	100,000	130,000
Marlow, Okla.	IC	3,050	1,800	.....	.....	.....	.....	.....
Stillwater, Okla.	Steam	8,000	.....	9,375	.....	.....	.....	9,375
Austin, Texas	Steam	102,000	40,000	.....	.....	40,000	60,000	100,000
Bryan, Texas	Steam	21,500	10,500	.....	.....	22,000	.....	22,000
	IC	4,790	.....	.....	.....	.....	.....	.....
	Total	26,290	10,500	.....	.....	22,000	.....	22,000

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Cooperatives								
East Kentucky	Steam	62,000	22,000	66,000				66,000
Total	**Steam**	**62,000**	**22,000**	**66,000**				**66,000**
Federal Agencies								
Corps of Engineers	Hydro	459,000		50,000	74,000	12,000	130,000	266,000
Tennessee Valley Authority	Hydro	2,377,900						
	Steam	5,522,250	2,500,000	850,000				850,000
	Total	7,900,150	2,500,000	850,000				850,000
Total	**Hydro**	**2,836,900**		**50,000**	**74,000**	**12,000**	**130,000**	**266,000**
	Steam	**5,522,250**	**2,500,000**	**850,000**				**850,000**
	IC							
	Total	**8,359,150**	**2,500,000**	**900,000**	**74,000**	**12,000**	**130,000**	**1,116,000**
East South Central	**Hydro**	**3,558,517**		**50,000**	**124,000**	**12,000**	**130,000**	**316,000**
Total All Agencies	**Steam**	**8,684,640**	**2,527,000**	**1,521,050**	**80,300**	**321,500**	**800,000**	**2,722,850**
	IC	**2,460**						
	Total	**12,245,617**	**2,527,000**	**1,571,050**	**204,300**	**333,500**	**930,000**	**3,038,850**

West South Central

Power Companies								
Central Louisiana Electric	Steam	65,000		54,000		55,000		109,000
Central P & L	Hydro	15,000						
	Steam	382,000	99,000	66,000		66,000		132,000
	IC	3,870						
	Total	400,870	99,000	66,000		66,000		132,000
Dallas P & L	Steam	496,250	115,000	115,000	125,000	125,000		365,000
	IC	6,000						
	Total	502,250	115,000	115,000	125,000	125,000		365,000
El Paso Electric	Steam	140,800			44,000			44,000
Gulf States Utilities	Steam	683,500		100,000		100,000		200,000
Houston Lighting & Power	Steam	1,171,000	156,000	156,000		312,000		468,000
Louisiana P & L	Steam	465,700	135,000			200,000		200,000
New Orleans Public Service	Steam	420,000			100,000			100,000
Denton, Texas	Steam	25,300	25,300				12,500	12,500
	IC	17,875						
	Total	43,175	25,300				12,500	12,500
Garland, Texas	Steam			19,750				19,750
	IC	3,162						
	Total	3,162		19,750				19,750
Lubbock, Texas	Steam	30,500			44,000			44,000
	IC	14,000						
	Total	44,500			44,000			44,000
San Antonio, Texas	Steam	329,000		100,000		100,000	100,000	300,000
Total	**Hydro**	**90,000**					**100,000**	**100,000**
	Steam	**649,675**	**85,175**	**141,775**	**122,000**	**162,000**	**192,500**	**618,275**
	IC	**69,291**	**4,300**	**2,555**	**2,500**	**2,555**	**4,055**	**11,665**
	Total	**808,966**	**89,475**	**144,330**	**124,500**	**164,555**	**296,555**	**729,940**
Cooperatives								
Brazos Electric Power	Steam	23,000			16,500	16,500		33,000
Deep East Texas Electric	Steam			5,000				5,000
Total	**Steam**	**23,000**		**5,000**	**16,500**	**16,500**		**38,000**
Federal Agencies								
Corps of Engineers	Hydro	501,000	75,000			50,000	771,000	821,000
Southwestern Power Administration	Hydro	501,000					235,000	235,000
Total	**Hydro**	**1,002,000**	**75,000**			**50,000**	**1,006,000**	**1,056,000**
West South Central	**Hydro**	**1,107,410**	**75,000**			**50,000**	**1,106,000**	**1,156,000**
Total All Agencies	**Steam**	**7,152,771**	**1,043,175**	**894,775**	**771,500**	**1,537,750**	**509,500**	**3,713,525**
	IC	**146,777**	**5,300**	**2,855**	**3,500**	**31,555**	**4,055**	**41,965**
	Total	**8,406,958**	**1,123,475**	**897,630**	**775,000**	**1,619,305**	**1,619,555**	**4,911,490**

Mountain

Power Companies								
Arizona Public Service	Hydro	7,000						
	Steam	361,500	100,000					
	IC	24,300						
	Total	392,800	100,000					
Public Service Company of Colorado	Hydro	41,635						
	Steam	483,100	112,500		122,000		100,000	222,000
	IC	2,250						
	Total	526,985	112,500		122,000		100,000	222,000
Southern Colorado Power	Hydro	1,500						
	Steam	63,468	17,100				20,000	20,000
	IC							
	Total	64,968	17,100				20,000	20,000

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Idaho Power	Hydro	371,700				360,000	423,000	783,000
	Steam							
	IC	1,350						
	Total	373,050				360,000	423,000	783,000
Montana Power	Hydro	421,940					120,000	120,000
	Steam	60,000						
	Total	481,940					120,000	120,000
Elko Lamoille Power	Hydro	200						
	IC	5,250			1,500			1,500
	Total	5,450			1,500			1,500
Southern Nevada Power	Steam	44,000	48,000		68,000		68,000	136,000
Public Service Co. of New Mexico	Steam	117,000			30,000		40,000	70,000
Public Service of Oklahoma	Hydro	482						
	Steam	554,090		125,000	37,500	125,000		287,500
	IC	15,959						
	Total	570,531		125,000	37,500	125,000		287,500
Tucson Gas, EL & P	Steam	100,500				75,000	75,000	150,000
	IC	15,140						
	Total	115,640				75,000	75,000	150,000
Utah P & L	Hydro	174,960						
	Steam	410,750	105,000		105,000			105,000
	IC	3,126	1,000					
	Total	588,836	106,000		105,000			105,000
Total	**Hydro**	**1,019,417**				**360,000**	**543,000**	**903,000**
	Steam	**2,194,400**	**382,600**	**125,000**	**362,500**	**200,000**	**303,000**	**990,500**
	IC	**67,375**	**1,000**		**1,500**			**1,500**
	Total	**3,281,200**	**383,600**	**125,000**	**364,000**	**560,000**	**846,000**	**1,895,000**
Municipal, State and Power District Systems								
Colorado Springs, Col.	Hydro	6,000						
	Steam	55,000			22,000			22,000
	Total	61,000			22,000			22,000
Gallup, N.M.	Steam	14,250	6,250					
Lamar, Colo.	Steam	9,000					7,500	7,500
	IC	2,000						
	Total	11,000					7,500	7,500
Raton Public Service Co.	Steam	6,000				5,000		5,000
Truckee-Carson-Irrigation District	Hydro	1,950	1,000					
	IC	2,000						
	Total	3,950	1,000					
Total	**Hydro**	**7,950**	**1,000**					
	Steam	**84,250**	**6,250**		**22,000**	**5,000**	**7,500**	**34,500**
	IC	**4,000**						
	Total	**96,200**	**7,250**		**22,000**	**5,000**	**7,500**	**34,500**
San Diego G & E	Steam	387,000		100,000		100,000		200,000
Southern California Edison	Hydro	943,220		10,000				10,000
	Steam	1,192,000	160,000	320,000	320,000			640,000
	IC	30,000						
	Total	2,165,220	160,000	330,000	320,000			650,000
Washington Water Power	Hydro	354,650					500,000	500,000
Total	**Hydro**	**3,704,906**	**113,000**	**43,000**	**20,000**	**186,000**	**1,945,000**	**2,194,000**
	Steam	**4,861,110**	**369,000**	**635,000**	**380,000**	**415,000**	**210,000**	**1,640,000**
	IC	**37,095**						
	Total	**8,603,111**	**482,000**	**678,000**	**400,000**	**601,000**	**2,155,000**	**3,834,000**
Municipal, State and Public Utility Systems								
Burbank, Calif.	Steam	70,000				44,000	44,000	88,000
Centralia, Wash.	Hydro	11,250	6,250					
Eugene, Or.	Hydro	24,000			30,000			30,000
	Steam	32,000						
	Total	56,000			30,000			30,000
Glendale, Calif.	Steam	60,000					33,000	33,000
Hetch Hetchy Water Supply & Power Project	Hydro	73,600					135,000	135,000
Imperial Irrigation District	Hydro	34,400		33,000				33,000
	Steam	50,000				44,000		44,000
	IC	13,276						
	Total	97,676		33,000		44,000		77,000
Los Angeles, Calif.	Hydro	733,000		3,200				3,200
	Steam	787,000	156,000	156,000		156,000	156,000	468,000
	IC							
	Total	1,520,000	156,000	159,200		156,000	156,000	471,200
Oakdale & South San Joaquin	Hydro				63,990			63,990
Pasadena, Calif	Hydro	11,000						
	Steam	115,000	40,000		40,000			40,000
	Total	126,000	40,000		40,000			40,000
PUD No. 1 of Douglas County	Hydro						310,000	310,000
PUD No. 1 Pend Orelile County	Hydro	60,000	60,000					
Sacramento Municipal Utility District	Hydro						206,000	206,000
Salt River Project	Hydro	70,890						
	Steam	120,000			100,000	100,000		200,000
	IC	10,000						
	Total	200,890			100,000	100,000		200,000
Seattle, Wash.	Hydro	551,656						
	Steam	53,000		116,000		57,000		173,000
	Total	604,656		116,000		57,000		173,000

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Cooperatives								
Empire Electric Ass'n	IC	.....	.....	800	.....	.....	.....	800
Plains Electric G & T	Steam	30,000	.....	.....	15,000	.....	.....	15,000
San Miguel Power Ass'n	Hydro	.....	.....	.....	.....	30,000	12,000	42,000
	IC	2,000	2,000	4,000	2,000	.....	.....	6,000
	Total	2,000	2,000	4,000	2,000	30,000	12,000	48,000
Total	**Hydro**	.....	.....	.....	.....	**30,000**	**12,000**	**42,000**
	Steam	**30,000**	.....	.....	**15,000**	.....	.....	**15,000**
	IC	**2,000**	**2,000**	**4,800**	**2,000**	.....	.....	**6,800**
	Total	**32,000**	**2,000**	**4,800**	**17,000**	**30,000**	**12,000**	**63,800**
Federal Agencies								
Bureau of Reclamation	Hydro	4,288,750	48,000	28,500	90,500	145,400	285,100	549,500
Corps of Engineers	Hydro	127,600	42,600	.....	.....	.....	80,000	80,000
Total	**Hydro**	**4,416,350**	**90,600**	**28,500**	**90,500**	**145,400**	**365,100**	**629,500**
Mountain	**Hydro**	**5,443,717**	**91,600**	**28,500**	**90,500**	**535,400**	**920,100**	**1,574,500**
Total All Agencies	**Steam**	**2,308,658**	**388,850**	**125,000**	**399,500**	**205,000**	**310,500**	**1,040,000**
	IC	**73,375**	**3,000**	**4,800**	**3,500**	.....	.....	**8,300**
	Total	**7,825,750**	**483,450**	**158,300**	**493,500**	**740,400**	**1,230,600**	**2,622,800**

Pacific

Power Companies								
California Electric Power	Hydro	87,570	.....	.....	.....	.....	.....	.....
	Steam	145,000	44,000	.....	60,000	.....	60,000	120,000
	Total	232,570	44,000	.....	60,000	.....	60,000	120,000
California Oregon Power	Hydro	274,240	29,000	33,000	.....	80,000	435,500	548,500
	IC	1,035	.....	.....	.....	.....	.....	.....
	Total	275,275	29,000	33,000	.....	80,000	435,500	548,500
Pacific G & E	Hydro	1,440,500	84,000	.....	.....	106,000	519,500	625,500
	Steam	2,866,300	165,000	215,000	.....	215,000	.....	430,000
	Total	4,306,800	249,000	215,000	.....	321,000	519,500	1,055,500
Pacific P & L	Hydro	238,526	.....	.....	.....	.....	350,000	350,000
	Steam	87,810	.....	.....	.....	100,000	.....	100,000
	IC	6,060	.....	.....	.....	.....	.....	.....
	Total	332,396	.....	.....	.....	100,000	350,000	450,000
Portland General Electric	Hydro	127,000	.....	.....	.....	.....	.....	.....
	Steam	98,000	.....	.....	.....	.....	150,000	150,000
	Total	225,000	.....	.....	.....	.....	150,000	150,000
Puget Sound P & L	Hydro	239,200	.....	.....	20,000	.....	140,000	160,000
	Steam	85,000	.....	.....	.....	.....	.....	.....
	Total	324,200	.....	.....	20,000	.....	140,000	160,000
Tacoma, Wash.	Hydro	238,000	.....	.....	.....	80,000	380,000	460,000
	Steam	59,000	.....	.....	.....	.....	.....	.....
	Total	297,000	.....	.....	.....	80,000	380,000	460,000
Total	**Hydro**	**1,807,796**	**66,250**	**36,200**	**93,990**	**80,000**	**1,031,000**	**1,241,190**
	Steam	**1,346,000**	**135,000**	**272,000**	**140,000**	**401,000**	**233,000**	**1,046,000**
	IC	**23,276**	.....	.....	.....	.....	.....	.....
	Total	**3,177,072**	**262,250**	**308,200**	**233,990**	**481,000**	**1,264,000**	**2,287,190**
Federal Agencies								
Bureau of Reclamation	Hydro	629,500	175,500	.....	.....	.....	233,000	233,000
Corps of Engineers	Hydro	1,663,400	567,000	600,000	412,000	568,000	1,631,000	3,211,000
Total	**Hydro**	**2,292,900**	**742,500**	**600,000**	**412,000**	**568,000**	**1,864,000**	**3,444,000**
Pacific	**Hydro**	**7,805,602**	**921,750**	**679,200**	**525,990**	**834,000**	**4,840,000**	**6,879,190**
Total All Agencies	**Steam**	**6,207,110**	**565,000**	**907,000**	**520,000**	**816,000**	**443,000**	**2,686,000**
	IC	**60,371**	.....	.....	.....	.....	.....	.....
	Total	**14,073,083**	**1,486,750**	**1,586,200**	**1,045,990**	**1,650,000**	**5,283,000**	**9,565,190**

U. S. Possessions

Alaska EL & P Co.	Hydro	1,600	.....	.....	.....	.....	.....	.....
	IC	2,500	.....	.....	2,500	.....	.....	2,500
	Total	4,100	.....	.....	2,500	.....	.....	2,500
Bureau of Reclamation Alaska	Hydro	30,000	15,000	.....	.....	.....	.....	.....
Chugach Electric Ass'n	Hydro	9,500	.....	.....	.....	.....	.....	.....
	Steam	3,595	.....	5,000	.....	.....	.....	5,000
	IC	2,495	2,495	.....	.....	.....	.....	.....
	Total	15,590	2,495	5,000	.....	.....	.....	5,000
Nome Light & Power Utilities	IC	630	.....	600	.....	.....	.....	600
Hawaiian Electric Co.	Steam	277,500	.....	.....	50,000	.....	.....	50,000
Puerto Rico Water Resources Authority	Hydro	90,000	.....	20,000	.....	.....	.....	20,000
	Steam	121,000	.....	40,000	40,000	40,000	.....	120,000
	Total	211,000	.....	60,000	40,000	40,000	.....	140,000
Virgin Islands Corp.	Hydro	.....	.....	865	1,016	.....	.....	1,881
	IC	5,895	.....	.....	.....	.....	.....	.....
	Total	5,895	.....	865	1,016	.....	.....	1,881
Total	**Hydro**	**131,100**	**15,000**	**20,865**	**1,016**	.....	.....	**21,881**
	Steam	**402,095**	.....	**45,000**	**90,000**	**40,000**	.....	**175,000**
	IC	**11,520**	**2,495**	**600**	**2,500**	.....	.....	**3,100**
	Total	**544,715**	**17,495**	**66,465**	**93,516**	**40,000**	.....	**199,981**

Canadian Capacity Additions—Kva Main Units

	Prime Mover	Capacity End 1955	1955	1956	1957	1958	After 1958	Total Additions Now Planned
Canada								
British Columbia Electric Co.	Hydro	606,200	.....	42,000	195,000	.....	240,000	477,000
	Steam	12,444	.....	.....	.....	.....	.....	.....
	IC	1,580	.....	.....	.....	.....	90,000	90,000
	Total	620,224	.....	42,000	195,000	.....	330,000	567,000
British Columbia Power Commission	Hydro	220,000	31,000	78,000	38,000	.....	.....	116,000
	IC	33,000	5,000	3,100	.....	.....	.....	3,100
	Total	253,000	36,000	81,100	38,000	.....	.....	119,100
Calgary Power	Hydro	222,000	20,000	.....	18,000	.....	.....	18,000
	Steam	.....	.....	66,000	.....	.....	66,000	132,000
	IC	.....	.....	.....	.....	25,000	.....	25,000
	Total	222,000	20,000	66,000	18,000	25,000	66,000	175,000
Canadian Utilities	Steam	32,750	.....	37,500	.....	.....	.....	37,500
	IC	19,750	5,250	.....	.....	.....	.....	.....
	Total	52,500	5,250	37,500	.....	.....	.....	37,500
Edmundston, New Brunswick	Hydro	1,400	.....	.....	.....	.....	.....	.....
	IC	3,845	2,125	.....	.....	.....	.....	.....
	Total	5,245	2,125	.....	.....	.....	.....	.....
Gatineau Power Co.	Hydro	708,259	36,000	.....	.....	.....	.....	.....
Great Lakes Power Co.	Hydro	114,550	.....	.....	25,500	.....	.....	25,500
Hydro-Electric Power Commission of Ontario	Hydro	3,607,220	402,500	64,000	186,000	492,000	540,000	1,282,000
	Steam	725,116	.....	.....	.....	23,500	.....	23,500
	IC	1,725	.....	.....	.....	.....	.....	.....
	Total	4,334,061	402,500	64,000	186,000	515,500	540,000	1,305,500
Lethbridge, Alberta	Steam	14,860	.....	.....	.....	.....	.....	.....
	IC	.....	.....	.....	8,000	.....	.....	8,000
	Total	14,860	.....	.....	8,000	.....	.....	8,000
Manitoba Hydro-Electric Board	Hydro	469,200	27,600	.....	.....	.....	540,000	540,000
	Steam	.....	.....	.....	70,588	70,588	.....	141,176
	IC	.....	.....	.....	.....	.....	.....	.....
	Total	469,200	27,600	.....	70,588	70,588	540,000	681,176
Maritime Electric Co.	Steam	14,500	.....	7,500	.....	.....	.....	7,500
Medicine Hat, Alberta	Steam	42,500	.....	.....	.....	.....	.....	.....
	IC	.....	.....	.....	.....	.....	10,000	10,000
	Total	42,500	.....	.....	.....	.....	10,000	10,000
New Brunswick Electric Power Commission	Hydro	33,700	.....	.....	40,000	40,000	40,000	120,000
	Steam	90,490	.....	23,529	.....	.....	50,000	73,529
	IC	5,160	.....	.....	.....	.....	.....	.....
	Total	129,350	.....	23,529	40,000	40,000	90,000	193,529
Newfoundland Light & Power Co.	Hydro	43,500	.....	.....	.....	.....	.....	.....
	Steam	.....	.....	11,000	.....	.....	22,000	33,000
	IC	2,500	.....	.....	.....	.....	.....	.....
	Total	46,000	.....	.....	.....	.....	.....	.....
New Westminster, British Columbia	Hydro	19,500	1,850	2,000	2,000	2,000	2,000	8,000
Northern British Columbia Power Co.	Hydro	7,740	1,650	.....	.....	.....	.....	.....
	Steam	2,000	.....	.....	.....	.....	.....	.....
	IC	5,335	.....	.....	.....	.....	.....	.....
	Total	15,075	1,650	.....	.....	.....	.....	.....
NW Territories Power Commission	Hydro	10,000	.....	.....	3,000	.....	.....	3,000
	Steam	.....	.....	.....	.....	500	.....	500
	IC	787	350	150	.....	250	.....	400
	Total	10,787	350	150	3,000	750	.....	3,900
Nova Scotia Light & Power Co.	Hydro	45,926	.....	.....	.....	.....	.....	.....
	Steam	91,530	35,350	.....	58,250	.....	58,250	116,500
	IC	2,550	.....	.....	.....	.....	.....	.....
	Total	140,006	35,350	.....	58,250	.....	58,250	116,500
Nova Scotia Power Commission	Hydro	75,275	5,000	4,500	.....	15,000	.....	19,500
	Steam	46,125	20,000	.....	.....	.....	20,000	20,000
	IC	2,275	.....	.....	.....	.....	.....	.....
	Total	123,675	25,000	4,500	.....	15,000	20,000	39,500
Quebec Hydro-Electric Commission	Hydro	1,577,000	.....	375,000	255,000	360,000	.....	990,000
Regina, Saskatchewan	Steam	85,000	30,000	.....	.....	.....	.....	.....
Saskatchewan Power Corp.	Steam	171,000	.....	79,000	82,500	82,500	.....	244,000
	IC	30,000	11,250	7,500	16,250	3,750	.....	27,500
	Total	201,000	11,250	86,500	98,750	86,250	.....	271,500
Shawinigan Water & Power Co.	Hydro	1,296,250	89,000	.....	.....	.....	.....	.....
United Towns Electric Co.	Hydro	10,550	.....	5,000	600	.....	.....	5,600
	IC	100	.....	250	.....	.....	.....	250
	Total	10,650	.....	5,250	600	.....	.....	5,850
Total	**Hydro**	**9,068,270**	**614,600**	**570,500**	**763,100**	**909,000**	**1,362,000**	**3,604,600**
	Steam	**1,328,315**	**85,350**	**224,529**	**211,338**	**177,088**	**216,250**	**829,205**
	IC	**108,607**	**23,975**	**11,000**	**24,250**	**29,000**	**100,000**	**164,250**
	Total	**10,505,192**	**723,925**	**806,029**	**998,688**	**1,115,088**	**1,678,250**	**4,598,055**

THIS IS THE LON C. HILL power station, newest in the CP&L system. It represents latest thinking in station design.

Central Power and Light expands Texas system with G-E equipped Lon C. Hill steam station

Meeting the growth of Texas' industry meant new generating capacity so Central Power and Light scheduled a new station, the Lon C. Hill plant. Now in full-time operation, the new station adds 66,000 kw of electric power.

Early in planning, CP&L and Sargent & Lundy Engineers selected General Electric apparatus. Working closely with utility and S&L engineers, a G-E power plant team assigned to the job helped assure that every phase of the Lon C. Hill plant was carefully coordinated.

This cooperation produced minimum delays in the exchange of information on equipment and was an important factor in assuring on-schedule start-up.

GENERAL ELECTRIC

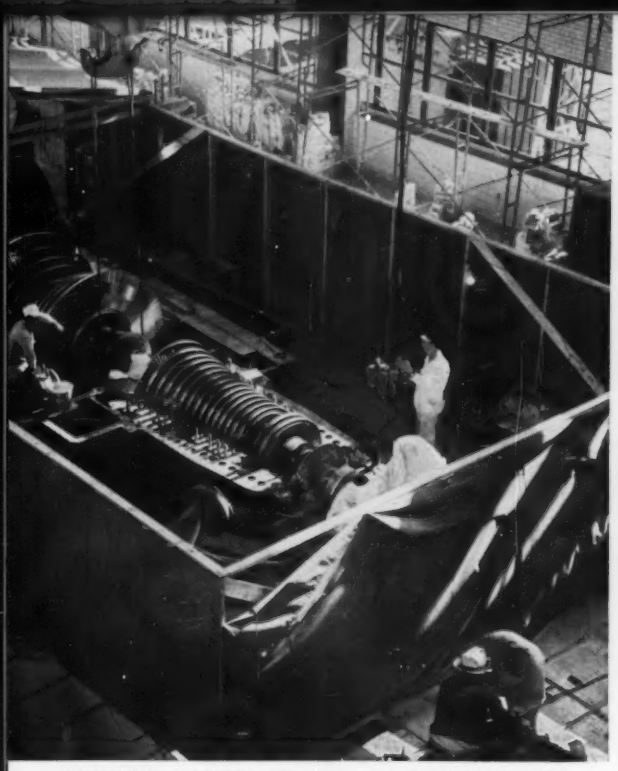
For More Data See Next Page ▶

THOROUGH PLANNING from outset of Lon C. Hill plant simplified apparatus procurement, meant faster design, manufacture, delivery, and installation. In conference above, G.E.'s W. J. Milkins, C. H. Linhoff, W. M. Bell, and A. L. Thayer discuss preliminary designs which helped Sargent & Lundy prepare detailed product specifications.

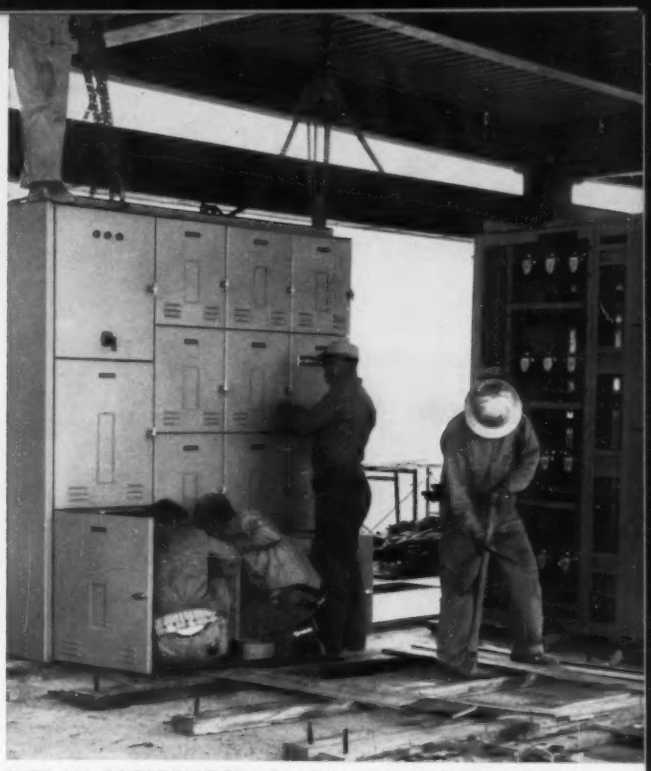
G-E planning, teamwork simplify ordering

PRELIMINARY SKETCHES, prepared by the G-E power plant team, get final review in meeting of G.E.'s R. M. Eichner and Mark Lovelady (seated), Central Power and Light's Vice President and Chief Engineer.

◀ **HIGHLIGHT OF DEDICATION** ceremonies was congratulations extended by Texas' Governor Allan Shivers to CP&L President Lon C. Hill for farsighted thinking and action.



EARLY INSTALLATION of turbine rotor for 66,000-kw G-E steam turbine-generator was made possible by efficient planning, early preparation of design specifications.



OVER-ALL COORDINATION of ordering meant that this low-voltage drawout switchgear, with magnetic air circuit breakers, was ready for installation at the proper time.

apparatus for new 66,000-kw CP&L plant

Thorough planning in early stages, single source of supply saved valuable time for CP&L, Sargent & Lundy engineers.

From earliest planning for Lon C. Hill, G-E engineers contributed important assistance to help speed equipment design and construction. The G-E application engineer, consulting with G-E product specialists, provided preliminary information on electrical equipment which helped S&L prepare detailed apparatus specifications.

As the station progressed, the value of having one electrical apparatus supplier to coordinate equipment design, manufacture, delivery, and installation became clear. S&L and CP&L engineers were freed of piecemeal expediting, could concentrate on the power plant's more important phases.

Such teamwork, combining utility, consultant, and the G-E team of sales engineers, product specialists, application engineers and service engineers, can save you time, money, and man-hours.

Here's what it can do:

Simplify ordering of equipment purchased either directly or through your consulting engineers, or through a machinery manufacturer.

Conserve engineering time by assisting with electrical equipment details, thereby freeing you and your consulting engineers for other urgent problems.

Integrate equipment design with consultant's plant design to assure the maximum flexibility and effectiveness of operation.

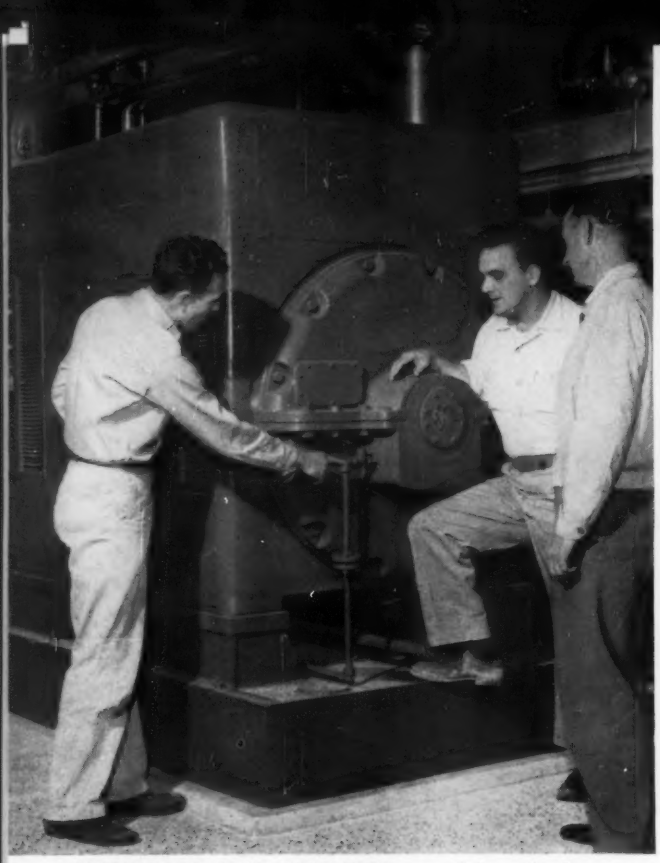
Speed construction by scheduling the arrival and disposition of equipment for maximum installation efficiency and on-time start-up.

Assist in training operators to better understand the full operating capabilities of the equipment.

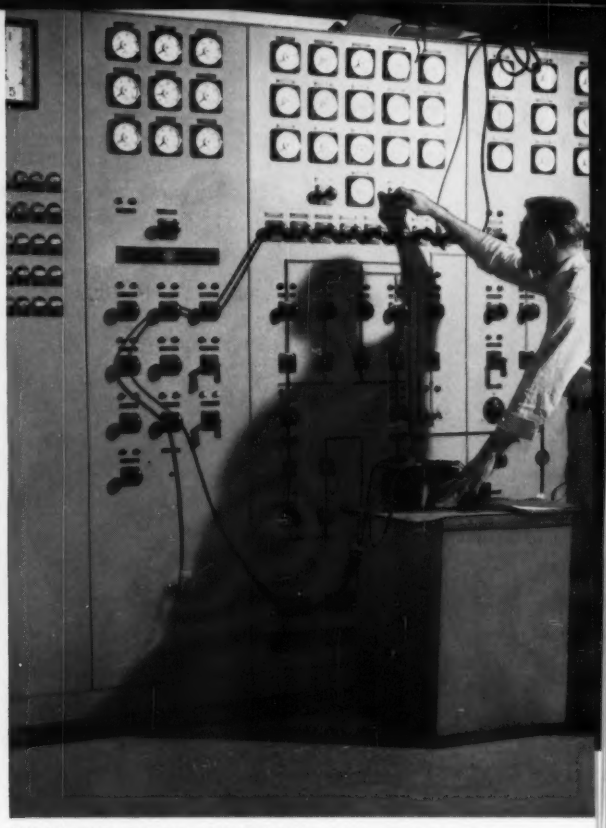
For details, contact your General Electric Apparatus Sales Representative. General Electric Company, Schenectady 5, N. Y. 302-7

MORE POWER TO AMERICA

GENERAL ELECTRIC



TRAINING OF YOUR OPERATORS, essential to the best performance of your equipment, is one of many functions of the G-E service engineer operating under G-E Power Plant Services.



CHECK-OUT OF ALL APPARATUS during initial start-up —and after—is your assurance of minimum unscheduled outages—your protection against costly shutdowns.

Another "Follow-through" of G-E Power Plant Services . . .

G-E service engineering helps keep plant at full-rated capacity after start-up

Successful completion of a power station goes far beyond initial start-up. When General Electric Power Plant Services are fully utilized on your job, station operators will be thoroughly trained to handle your equipment. Also, performance of equipment is carefully checked during initial operation. And G-E maintenance specialists outline a detailed apparatus up-keep program to minimize unscheduled outages and costly shutdowns.

Service engineering is just one of many G-E Power Plant Services on your job when you or your consultant specifies G-E equipment. You can take advantage of all these G-E services:

Application engineering helps assure all electrical equipment is coordinated in design and operation to best suit the requirements of your plant.

Product development engineering means equipment design which reflects both field experience and laboratory achievements.

Installation supervision means competent direction of installation, planned start-up, and training of operators to help assure proper operation of equipment.

Product Services extend factory support to field service engineering, thus assuring the application of full G-E engineering and manufacturing facilities on its supervised installations and maintenance programs.

Power Plant coordination helps assure proper selection, design, manufacture, delivery of your equipment without costly delays at installation time.

MORE POWER TO AMERICA

GENERAL ELECTRIC

GENERATION—Maintenance

Dam Faces Protected Against Weathering . . .

Steel-plate refacing of upstream facades on two dams at Huntington Lake reservoir of Southern California Edison Co protect the concrete faces from effects of weathering. Installation of the plates follows their experimental use at Edison's Florence Lake dam with excellent results.

Main Dams Built in 1917

Steel plates were chosen because of their superiority over other protective coverings. Mastic waterproofing membrances, used elsewhere, have not proved successful on a tall, vertical surface. Thin facings of rigid materials have not been satisfactory where severe temperature changes are a factor. Another condition that pointed to steel for the facing material is the action of 4 to 5 ft of ice on the face of the dam as the level of the reservior changes.

Main concrete dams at Huntington Lake were completed in 1917. Faces of the dams were damaged as receding lake levels allowed snow and freezing temperatures to weather the concrete. Provided with an opportunity to drain the reservoir, the company decided to add the steel plates to halt further weathering.

Edges Electrically Welded

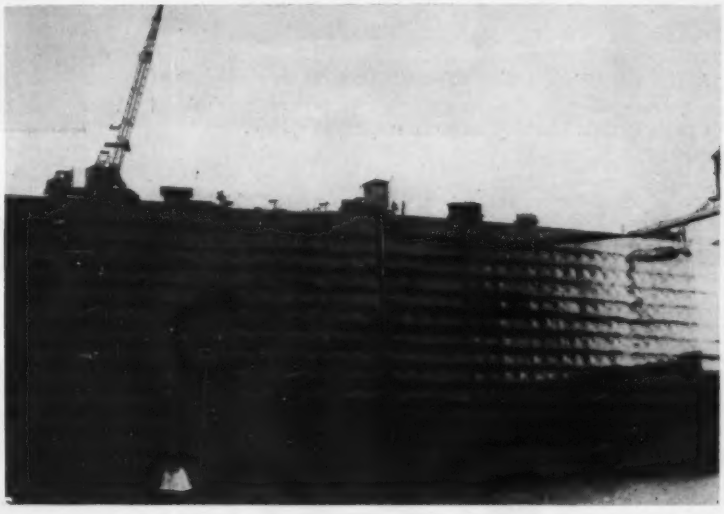
Only the upper 105 ft of each dam was resurfaced. Rock anchor bolts, 1 in. in dia, 6 ft long, threaded at one end and with a wedge on the other, were placed about 6 ft apart in the face of each dam. Pre-drilled steel plates were attached to the bolts with a washer and nut. Edges of adjoining plates were electrically welded to form a watertight seal. Plates also were welded to the bolts. A minimum of 6 in. of concrete poured behind each plate provides a uniform bearing area between the plate and the irregular surface of the dam.

After all plates were installed and welded, they were sandblasted and coated with a coal-tar material called "Tarset". Finally, the entire surface of each dam was sprayed with aluminum paint.

(*More How To on page* 190)

by mounting steel plates on anchor bolts . . .

covering plates with coal-tar coating, and . . .

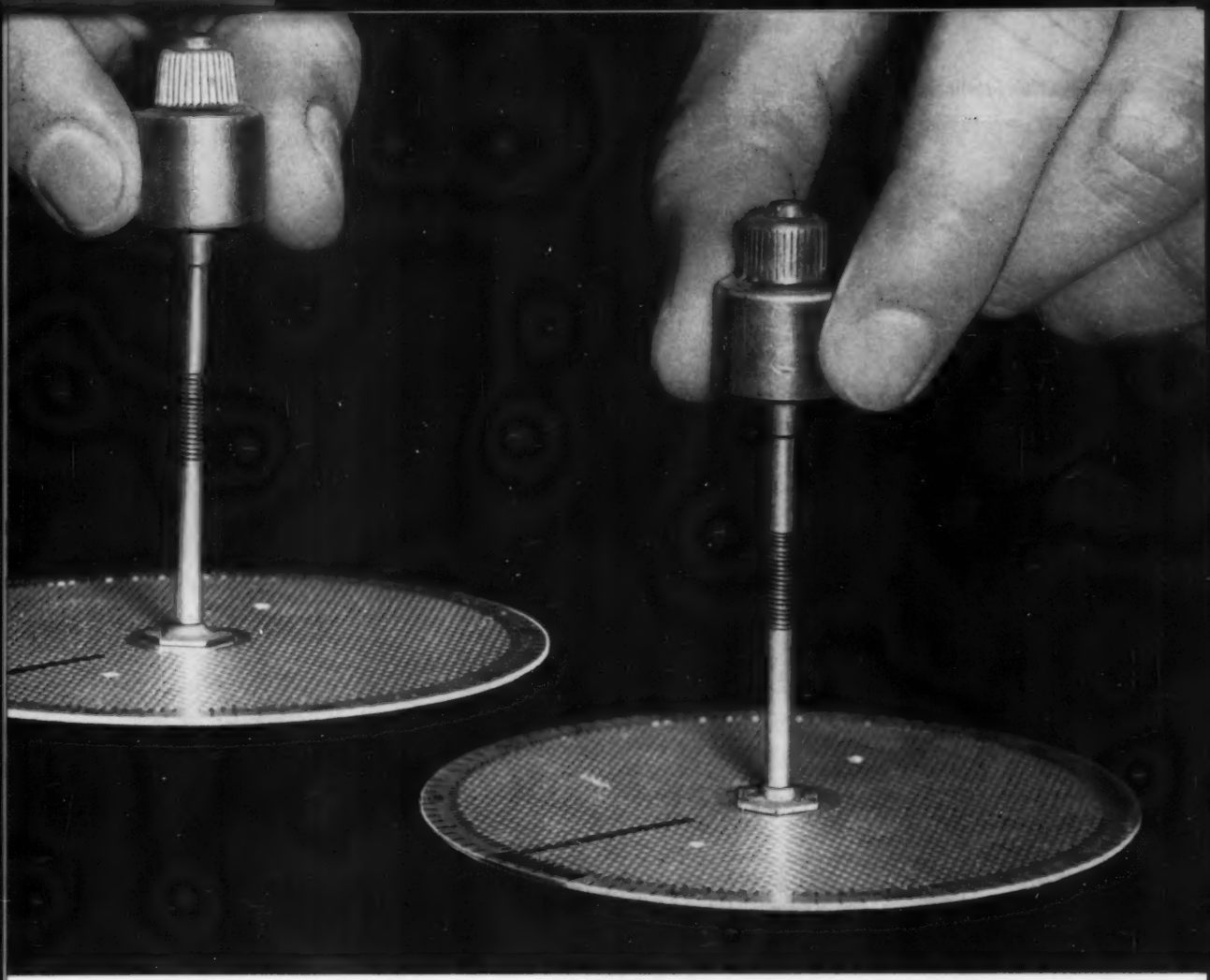


applying aluminum paint to entire surface

AFTER 250 MILLION DISK REVOLUTIONS, or an equivalent of more than 300 years of meter operation, life tests show no bearing wear in General Electric's magnetic suspension system.

Life Tests Prove...

LABORATORY RUNNING TESTS on sample lots of General Electric's I-50 meter family serve as additional checks on over-all meter performance and the lifetime characteristics of the magnetic suspension system.



No Bearing Wear

A true lifetime bearing system, already having registered the equivalent of more than 300 years' use under normal operating conditions, is now assured with all members of General Electric's I-50 meter family. Results from continuing accelerated life tests, conducted in General Electric research laboratories, prove that the revolutionary magnetic suspension system eliminates the need for bearing replacement.

These General Electric meters have registered more than 250 million revolutions of the floating disk. This is equal to over 300 years of meter operation at the national average load of 3000 KWH annually. Results show no measurable wear on the graphite washer or guide pin in G.E.'s magnetic suspension system.

These tests substantiate the perfect record of the magnetic suspension system in the more than 6,000,000 I-50 meters in service today. They offer proof that G.E.'s meter family—by eliminating bearing maintenance and replacement expenses—assures you of lower metering costs. For more information contact your nearest G-E Apparatus Sales Office or write General Electric Company, Section 621-4, Schenectady 5, N. Y.

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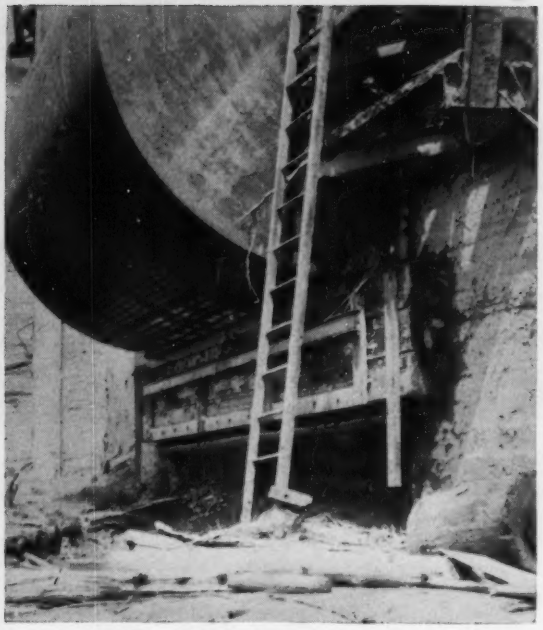


Rotating Rack Clears Trash from Plant Intake

H. B. WOLF, Manager of Operations, Duke Power Co, Charlotte, N. C.

Rotating trash racks, developed by Duke Power Co to replace the stationary trash racks at two older hydroelectric plants, clear debris from the intakes continuously. In so doing, the new racks increase production by eliminating generator shutdowns to remove trash and reduce cost by largely eliminating rack cleaning labor.

Previously, when lots of trash came down the river during high water, racks would become clogged; and the capacity of each of the six generators would drop from 3,600 to 600 kw in only four hours. A crew could not clear all six older racks before the first one cleared was again clogged.

Looks Like Squirrel Cage

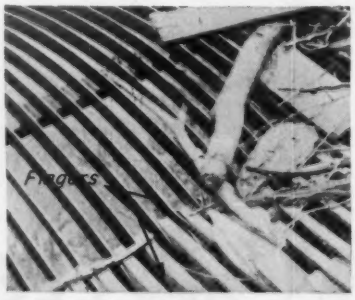
The rotating trash rack, costing $16,000 installed, looks like a large squirrel cage, and is 17 ft long and 12 ft in dia. It has solid end plates and sides of 2 x ¼ in. bars, formed in circles and spaced 2¼ in. apart. The inside edges of the bars are welded to 12 T-iron supports, six of which are welded to spokes radiating from a shaft.

The shaft consists of a 17-ft long, 16-in. dia, ⅜-in. thick pipe having a 7½-in. dia solid stub welded to both ends. This solid stub rotates in a bearing.

Manhole Provided

A 2½-ft square manhole is provided in one of the solid end plates to permit removing debris from within the cage. Attached to the other end plate is a sprocket that is chain driven at 1 rpm from a 2-hp, 1,800-rpm motor which is situated on the top of the dam.

To install a rotating rack a section of the old rack is cut away, and structures for bearings are mounted on the face of the dam. The squirrel cage is then floated, on barrels, to the intake and installed.



Bars Form Platform

The gap between the top of the squirrel cage and the old trash rack is closed with steel bars which form a platform. From the edge of this platform, steel bars or fingers, about 23-in. long, protrude into the space between the bars of the cage, thus forming a very effective rake.

As the cage rotates, debris is carried to the top of the cage and picked off by the fingers. The debris deposited on the fingers and platform is then tossed onto a barge which carries it away for disposal.

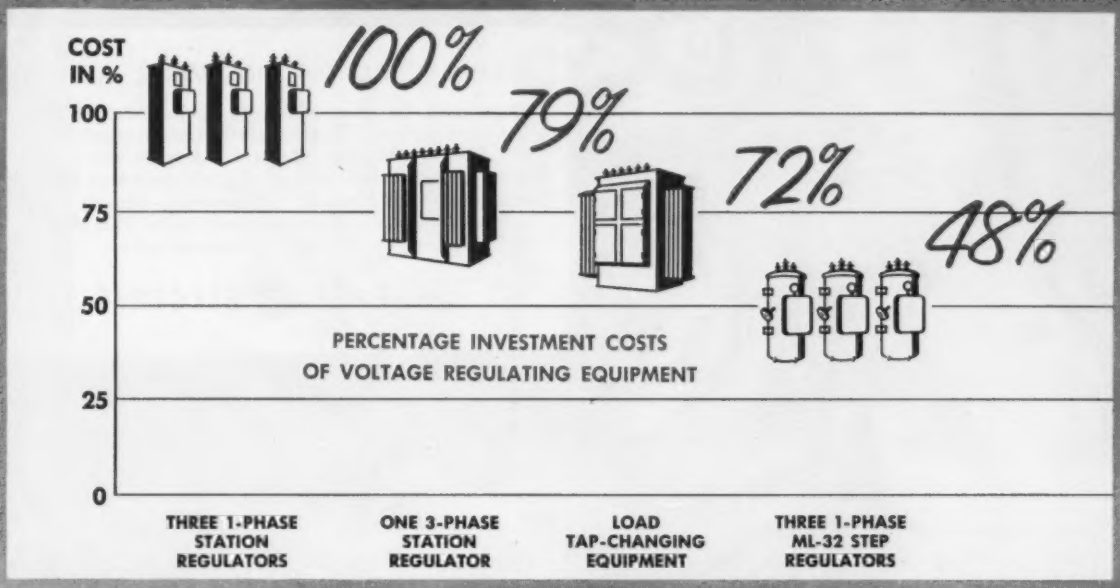
Sprockets Have Guards

For the initial installation, timbers were placed between the bottom of the squirrel cage and the old rack to close the gap.

However, for other installations an I-beam is secured below the cage, and a rack section connects the beam to the old rack.

To prevent logs from breaking the drive chains, guards are placed around the sprokets.

(*More How To on page* 194)



Cost comparison shows ML-32 voltage regulators

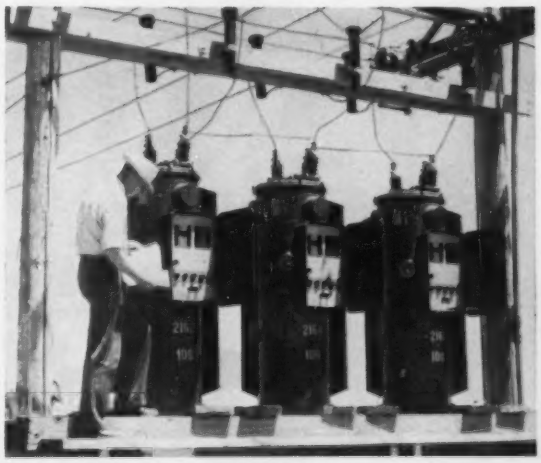
REDUCE REGULATOR INVESTMENT 50%

With new higher KVA ratings and increased current-carrying capacity now available, General Electric pole-type, single-phase Type ML-32 step voltage regulators make possible low-cost regulation in a wide range of applications, including substations as large as 8000 kva.

Compared with more expensive equipment, they can cut the cost of efficient regulation by more than 50 percent, as shown in the chart above. (This representative illustration compares the approximate relative costs of regulating a typical 3000 kva, 4 kv substation.)

Increased opportunities are thus offered to utilities not only to extend the use of voltage regulation, but also to benefit from increased revenues and savings through deferred investment in line rebuilding.

General Electric ML-32 regulators offer ±10% regulation in thirty-two 5/8% steps, in all standard voltage classes for circuits up to and including 14.4/24.9 kv. In addition, when installed on lines requiring only ±5% regulation, the G-E ML-32 step regulator will comfortably carry 160% of rated current (to a maximum of 400 amperes). For information on ratings and applications, get in touch with your local General Electric Apparatus Sales representative, or write for publication GER-1154 to Section 423-11, General Electric Company, Schenectady 5, N. Y.



ONLY THE ML-32 REGULATOR gives you ALL the most advanced features—including Class 1 control accuracy, control dial locking, "Bounce-free" Opti-life switching for increased contact life, up to 120 seconds time delay, internal by-pass protection and many other advantages. They add up to the most efficient, economical regulator of its type available today!

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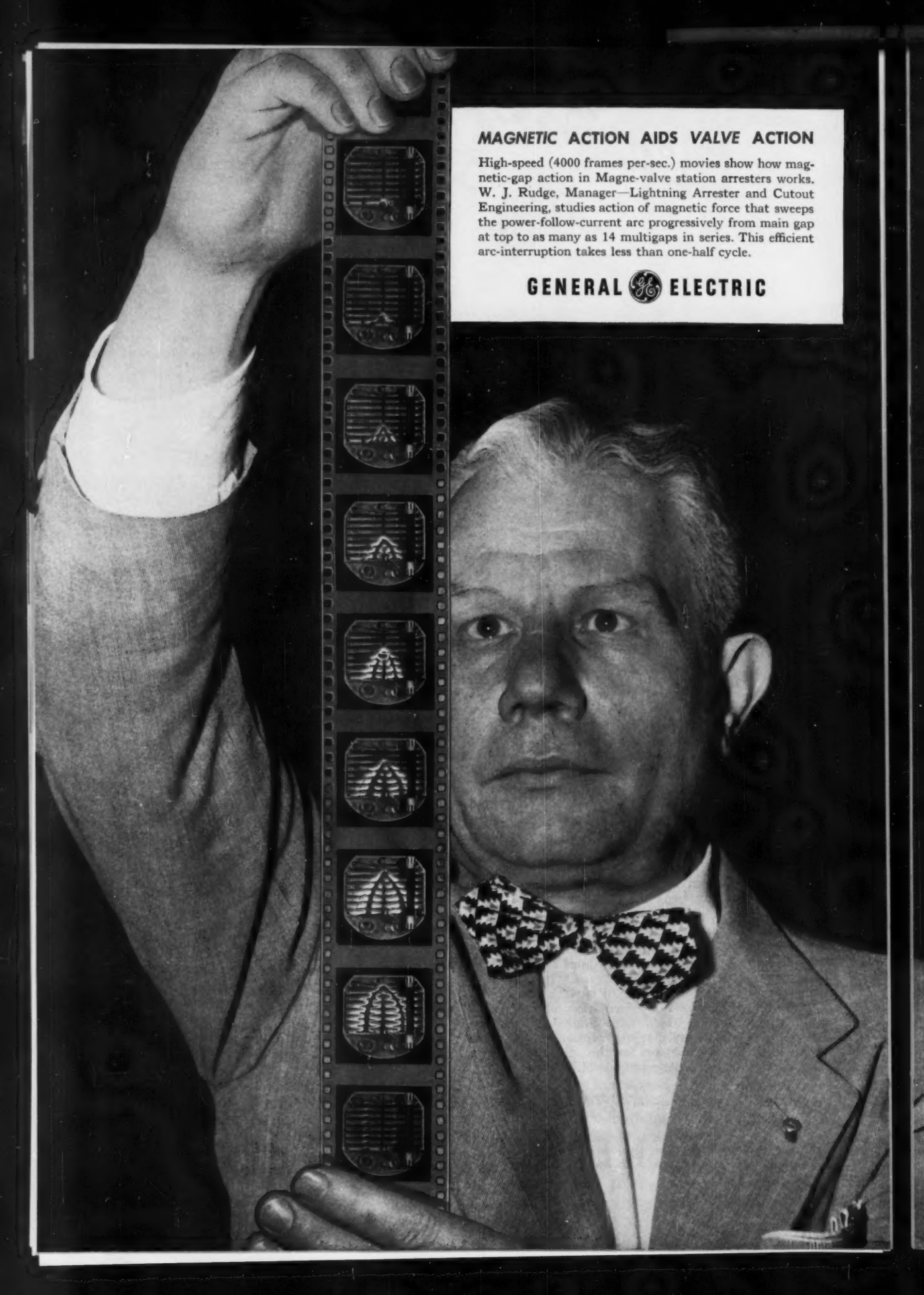
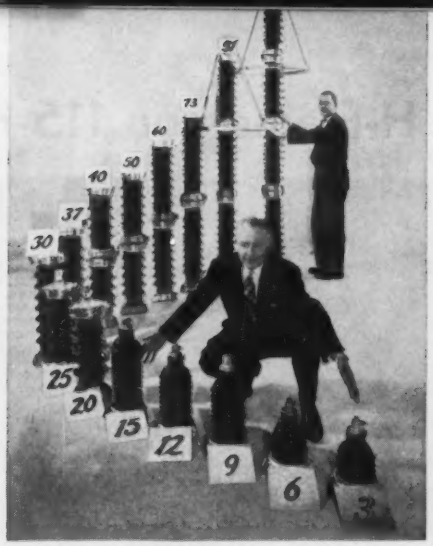
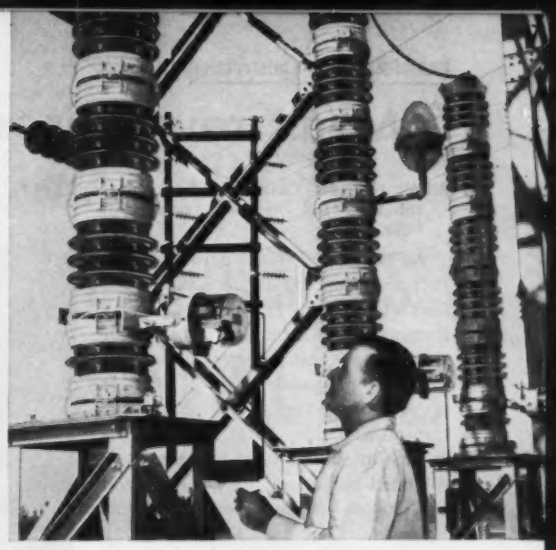

MAGNETIC ACTION AIDS VALVE ACTION
High-speed (4000 frames per-sec.) movies show how magnetic-gap action in Magne-valve station arresters works. W. J. Rudge, Manager—Lightning Arrester and Cutout Engineering, studies action of magnetic force that sweeps the power-follow-current arc progressively from main gap at top to as many as 14 multigaps in series. This efficient arc-interruption takes less than one-half cycle.
GENERAL ELECTRIC



NEW G-E LINE ARRESTERS have far higher reliability because of Thyrite Magne-valve design. Seven new ratings extend line from 3–121 KV.



NEW G-E STATION ARRESTERS have discharged lightning currents of 20,000 amperes with up to 30 operations per year recorded in actual service.

NEW G-E station and line arresters with exclusive "Magne-valve" action give 20% greater lightning protection

That high-speed movie film strip at the left shows the most significant forward step in lightning arresters in the past 25 years. You're looking at the magnetic-gap action of General Electric's "Magne-valve" principle—a combination of ***magnetic*** action of series gaps and ***valve*** action of improved Thyrite* disks.

HERE'S WHAT IT MEANS TO YOU: MAXIMUM LIGHTNING PROTECTION.

On both station and line arresters, you get as much as 20% more protection. With "Magne-valve" station arresters you get ***protection*** for one-step reduced insulation equal to that previously given to full insulation; better ***protection*** to rotating machines and dry-type transformers. You get three times greater discharge capacity to withstand multiple strokes, severe switching surges, and long-duration discharges.

LINE OR STATION— WHICH SHOULD YOU CHOOSE?

G.E's new "Magne-valve" principle has resulted in improved performance for both. Although there isn't any simple formula that can be applied everywhere, G-E station arresters are generally preferred for locations where size and importance of apparatus demand the best in protection for uninterrupted service continuity.

But the final selection depends on your particular application—the economics and engineering involved in each specific location.

To help you select the right type of Magne-valve arrester, call in an Application Engineer from your local G-E sales office. Bulletins GEA-1304 (New Station Arrester) and GEA-2978 (New Line Arrester) are available for the asking. Write to General Electric Company, Schenectady 5, New York. 432-13

*Reg. Trade-mark of General Electric Co.

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5-Man Crew Raises H-Frames on 115-Kv Line

R. W. BECKEN, Construction Superintendent, Otter Tail Power Co, Fergus Falls, Minn.

A single, five-man crew replaces H-frames on the Otter Tail Power Co's far-flung, 115-kv system by framing the whole structure, except the X-braces, on the ground.

In this procedure, a 45-ft gin pole is set along the centerline of the transmission line, 15 ft from the H-frame holes. An open-top sheave is mounted on top of the gin pole, and butt boards are placed in the H-frame holes.

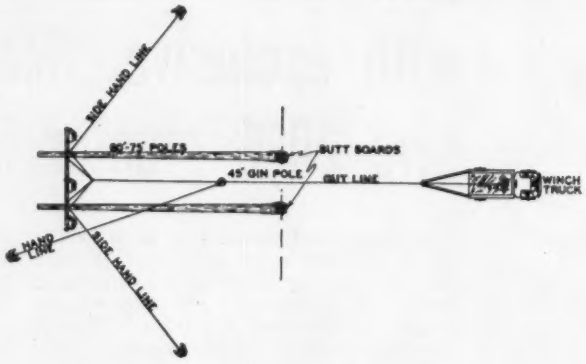
Other Applications Seen

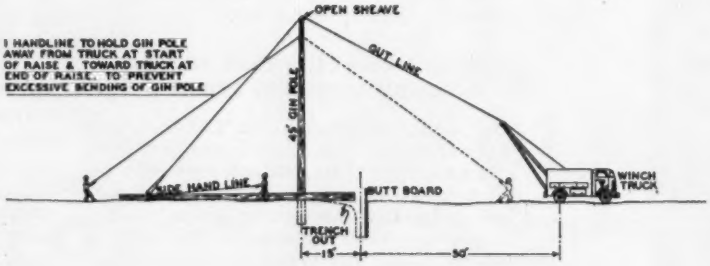
One man holds each side guy on the H-frame. One guy line holds the gin pole away from the truck when pole raising starts and towards the truck when the pole has been raised to prevent excessive bending of the gin pole.

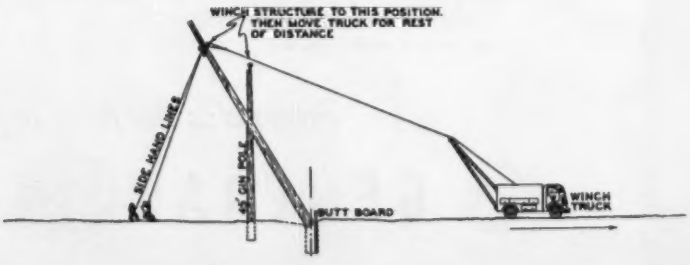
A winch line is then run over the sheave on the gin pole's top and fastened to the top of the H-frame structure. This structure is on the ground, the butts of the poles near the holes and in line with them. The structure is winched up to the position shown in lowest drawing and the truck then moves forward until the structure is in place. Winching a structure into place takes 10 min.

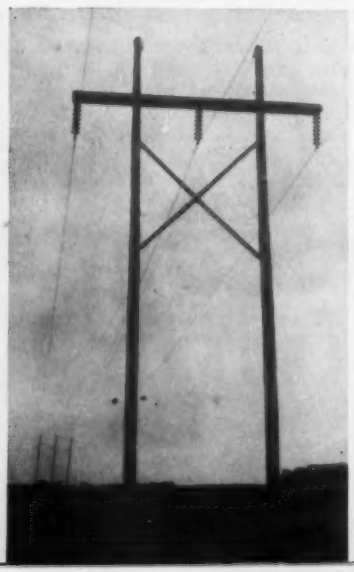
Although the method has been used thus far only on 60-ft structures with class 3 poles, the company feels it can be used for raising higher structures with heavier poles safely and easily.

(*More How To on page* 200)




OPEN SHEAVE
1 HANDLINE TO HOLD GIN POLE AWAY FROM TRUCK AT START OF RAISE & TOWARD TRUCK AT END OF RAISE. TO PREVENT EXCESSIVE BENDING OF GIN POLE
GUY LINE
45' GIN POLE
SIDE HAND LINE
BUTT BOARD
WINCH TRUCK
TRENCH OUT
15'
50'





General Electric now ready to furnish HIGH-VOLTAGE POWER TRANSFORMERS INSULATED TWO STEPS BELOW "FULL B.I.L."

. . . with no sacrifice in reliability

Endorsement of further extension of this cost-saving practice results from new information on switching surges and the switching-surge and long-time strengths of transformers

The amount of insulation in a transformer is one of the principal things that determines its cost. That's why *all* domestic utilities purchasing 230,000-volt and 330,000-volt transformers in the past several years—and *many* buyers of units for lower voltages—have specified that their transformers should be insulated at 1 or 1½ steps BELOW the "Full B.I.L." corresponding to the voltage of their system.

Still further reductions in insulation level were economically attractive, and to obtain actual experience, General Electric in 1951 and 1952 shipped 12 large power transformers for 138,000-volt and 230,000-volt systems with insulation levels reduced two classes. With modern G-E lightning arresters, lightning and impulse voltages were no longer problems, but we felt it desirable before proceeding on a general basis, to extend our knowledge of switching surges, and switching-surge and long-time strengths of transformers.

New information has now been obtained from the test and research facilities of the G-E High Voltage Laboratory at Pittsfield, Mass., and the pioneer transformers placed in service four and five years ago have been operating entirely successfully.

GENERAL ELECTRIC NOW OFFERS POWER TRANSFORMERS INSULATED "TWO STEPS DOWN" . . . WHEN PROTECTED WITH THE LATEST G-E LIGHTNING ARRESTERS . . . AND WITH NO SACRIFICE IN RELIABILITY.

Going from Full B.I.L. to 1½ steps down saves the purchaser about 25% in first cost. The added ½ step saves approximately 10% more. For example, in a single substation now being considered, a saving of $160,000 will be realized. Conservative estimates indicate that the utility industry will purchase 30,000,000 kva of power transformers, 230,000 volts and higher, during the next 5 years. If these units are 2 steps down instead of 1½, utilities will save about $15,000,000 in first cost alone.

System planning, designing, and operating engineers will also welcome the accompanying reductions in losses, impedances, weights, and dimensions. A word to your G.E. Sales Engineer and his Transformer Specialist will bring you more specific information on what "two steps down" can mean to your next high-voltage power transformers. General Electric Company, Schenectady, N. Y. 421-47

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GENERAL ELECTRIC

NEW G-E AUTOMATIC

Automatically Computes and Executes

The Most Economical Loading Schedules

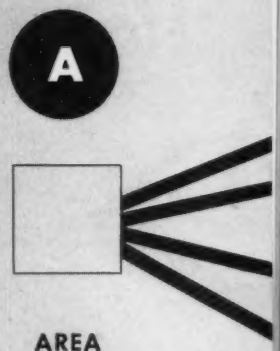
To help solve the problem of meeting power demand at the lowest possible cost, General Electric has developed a new, integrated system for automatic dispatching of generation.

A RADICALLY IMPROVED SOLUTION to the dispatch of an entire power system, the General Electric automatic dispatching system both computes and executes the most economical loading schedules. The costly, time-consuming job of detailed scheduling is completely eliminated.

MINIMUM FUEL INPUT TO BOILERS is assured because the most economical loading schedules, limited by practical conditions, are automatically computed and executed continuously.

CO-ORDINATED CONTROL is provided by the new G-E system because it automatically combines data handling, communication, computation, and routine supervision.

FURTHER INFORMATION may be obtained by contacting your nearest G-E Apparatus Sales Office, or write Section 585-13, General Electric Company, Schenectady 5, New York.



AREA DISPATCHING OFFICE

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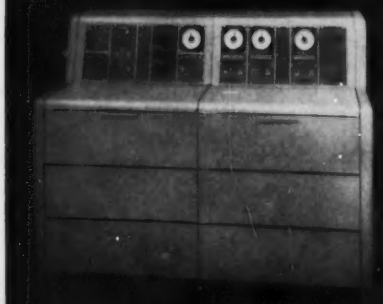
GENERAL ELECTRIC

MASTER AREA AND DISPATCHING CONSOLE — MASTER STATION AND MACHINE CONSOLE

Here Are The Consoles That Make Up G.E.'s New System

A

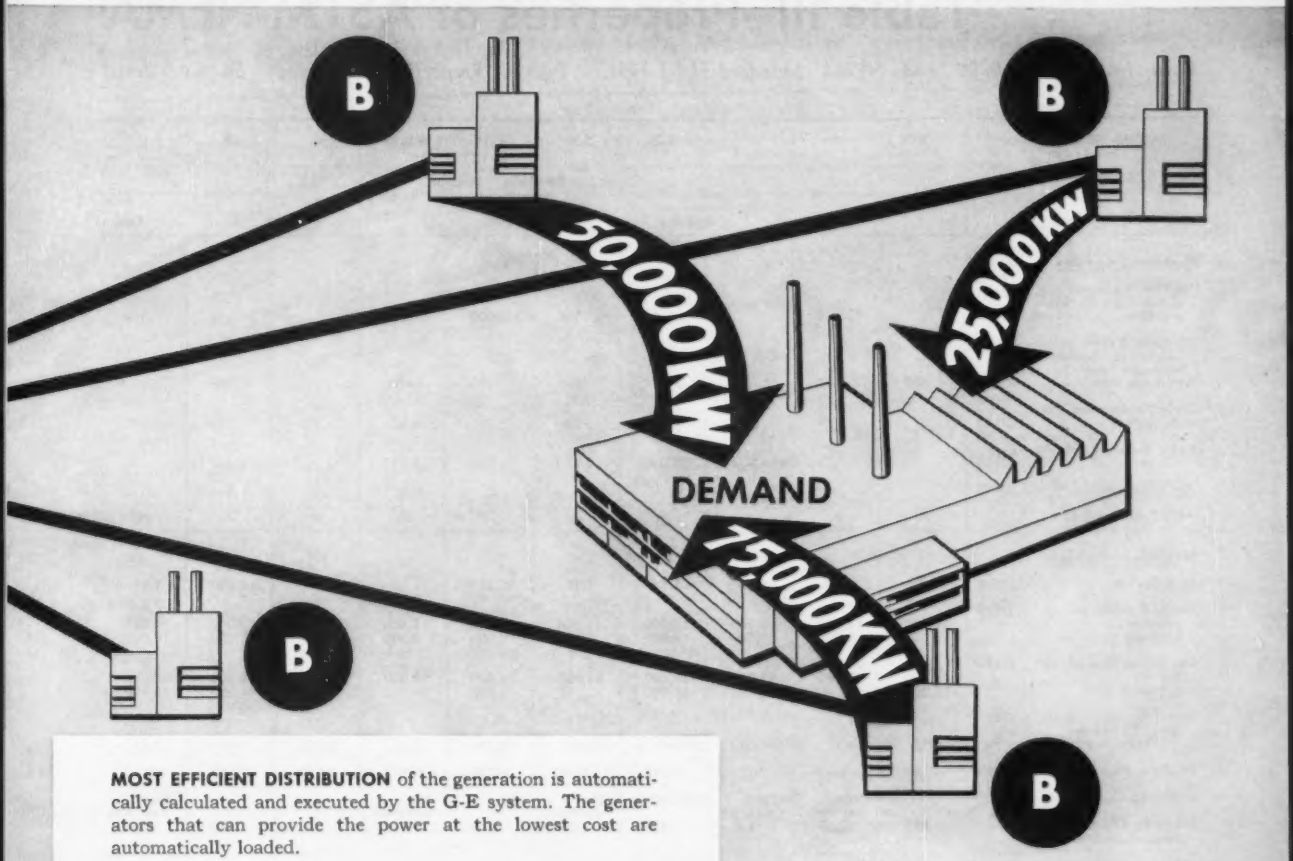


B

AT THE AREA DISPATCHER'S OFFICE is located the master area and dispatching console. The master area console section develops the signal for the operating area. The dispatching section modifies this signal for each station to consider transmission losses.

AT THE STATION is located the master station and machine console. The master section provides all the adjustments for controlling the entire station. Controls for two machines, including incremental cost curve settings, are provided in each machine console section.

DISPATCHING SYSTEM



MOST EFFICIENT DISTRIBUTION of the generation is automatically calculated and executed by the G-E system. The generators that can provide the power at the lowest cost are automatically loaded.

KEY BENEFITS OF G-E SYSTEM

1. Most economical schedule is automatically computed and executed based on loading at equal incremental cost
2. Completely eliminates the need for detailed loading schedules
3. Addition or removal of machines does not require any readjustment of control equipment
4. Only one channel is required to control each generating station, thus relieving communication facilities
5. Transmission-loss penalty factors are easily applied to each station manually
6. No recorders are required as an integral part of the G-E automatic dispatching system
7. Panel space is not required because all components are mounted in consoles
8. Continuous and synchronized control is provided by the use of a highly accurate selsyn system

Table III—Properties of ASTM-NEMA

Data from ASTM-D709 and NEMA Standard LP-1-1951. Typical Property Values May be Considered

ASTM-NEMA Grade Insulation		X	P	PC	XX	XXP	XXX	XXXP	C	CE	L
Type of Binder		Phenolic									
Filler		Cellulose Paper							Cotton		
Electrical Properties	ASTM Method										
Insulation Resistance (Cond. C-96/35/90), megohms	D257	.....	.....	.....	60	500	1,000	20,000	.....	.....	.....
Dielectric Strength, perpendicular to laminations, short-time test, ⅛ in. thickness, vpm	D149	500	470	425	500	500	470	470	.....	360	.....
Dielectric Constant, Cond. A—10^6cps	D150	.....	.....	.....	6.00	5.20	5.70	4.80	.....	.....	.....
Power Factor, Cond. A—10^6cps	D150	.....	.....	.....	0.050	0.050	0.045	0.035	.....	.....	.....
Arc Resistance, sec	D495	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
AIEE Insulation Class	...	A	A	A	A	A	A	A	A	A	A
Mechanical Properties											
Specific Gravity	D792	1.36	1.33	1.34	1.34	1.32	1.32	1.30	1.36	1.33	1.35
Tensile Strength, psi	D229										
Lengthwise		20,000	12,000	10,500	16,000	11,000	15,000	12,400	11,200	12,000	14,000
Crosswise		16,000	9,000	8,500	13,000	8,500	12,000	9,500	9,500	9,000	10,000
Compressive Strength, psi	D229										
Flatwise		36,000	25,000	22,000	24,000	25,000	32,000	25,000	37,000	39,000	35,000
Edgewise		19,000	.....	.....	23,000	.....	25,500	.....	23,500	24,500	23,500
mpact Strength, ft-lb/in. Izod Notched Bar	D229										
Lengthwise min		0.55	0.55	0.60	0.40	0.45	0.40	0.35	2.10	1.60	1.35
Hardness, Rockwell	D785	M110	M95	M75	M105	M100	M110	M105	M103	M105	M105
Machining Qualities	...	.....	Hot punching	Cold punching	Good	Hot punching	.....	Hot punching	.....	.....	Fine machining
Maximum Operating Temperature, continuous, F	...	225	250	200	250	250	250	250	225	250	225
Chemical Properties											
Water Absorption, ⅛ in. thickness, max. %	D570	3.30	2.20	3.00	1.30	1.10	0.95	0.75	2.50	1.60	1.60
Basic Color	...	Natural or Black	Natural, Black or Chocolate		Natural or Black	Natural or Black	Natural or Black	Natural	Natural or Black	Natural or Black	
Resistant to:											
Dilute Acids	...	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dilute Alkalines	...	No	No	No	No	No	No	No	No	No	No
Solvents	...	Yes	Not acetone		Yes	Not acetone	Yes	Not acetone	Yes	Yes	Yes
Uses	...	Mechanical	Mechanical, Hot punching stock	Mechanical, Cold punching	Electrical, Mechanical	Electrical, Mechanical, Hot punching	Electrical, High humidity	Electrical, High humidity, Hot punching stock	Mechanical	Electrical, Mechanical	Mechanical, Fine machining

Trade Names.

Typical trade names of laminated thermosetting sheets and names of the respective manufacturers are shown on the opposite page. Most manufacturers listed here make all ASTM-NEMA Grades. They use either ASTM-NEMA grade designations or indicate their grades which are equivalent.

Third in a series of four tables covering properties of typical plastics used primarily for electrical insulation.

Table 1—Properties of Plastic Insulations without Fillers: Part 1 was published in Electrical World, Oct. 17, 1955, pp 160-161; Part 2, Oct. 31, 1955, p 88; Table 2—Properties of Plastic Insulations with Fillers: Part 1 was published Nov. 14, 1955, p 158; Part 2, Nov. 28, 1955, p 98.

Grades of Laminated Thermosetting Sheets

Representative for that Grade. These Values Must Not be Used as Specification Requirements.

LE	MC†	A	AA	G-1	G-2	G-3	G-5	G-6	G-7	GPO-1†	N-1
	Melamine	Phenolic					Melamine	Silicone		Polyester	Phenolic
Fabric		Asbestos Paper	Fabric	Glass Cloth						Glass Mat	Nylon Cloth
30	.....	.....	.....	.....	5,000	.....	100	.....	2,500	.....	50,000
360	.....	160	.....	200	425	600	260	185	350	.....	459
6.0	.....	.....	.....	.....	5.80	.....	8.00	4.90	4.20	.....	3.90
0.070	.....	.....	.....	.....	0.080	.....	0.080	0.060	0.022	.....	0.039
.....	100	.....	.....	.....	.....	.....	180	180	180	100	.....
A	.....	B	B	B	B	B	B	H	H	B	A
1.33	.....	1.72	1.70	1.60	1.50	1.65	1.90	1.65	1.68	.....	1.15
13,500 9,500	....	10,000 8,000	12,000 10,000	12,500 9,500	16,000 11,000	23,000 20,000	37,000 30,000	....	23,000 18,500	....	8,500 8,000
37,000 25,000	....	40,000 17,000	38,000 21,000	50,000	38,000 15,000	50,000 17,500	70,000 25,000	40,000 9,000	45,000 14,000	....	Cold flow
1.25	0.55	0.60	3.60	5.00	4.50	6.50	6-9	6.0	6.5	.....	3.0
M105	.....	M111	M103	M110	M105	M100	M120	M95	M100	.....	M105
Fine machining 250	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	.....	275	275	290	275	290	300	400	400	.....	165
1.30	2.5	0.95	2.50	2.00	0.95	2.00	2.00	0.35	0.35	.....	0.40
Natural or Black	Natural	Natural or Gray Black	Natural	Natural	Natural	Natural	Natural	Natural	Natural	.....	Natural
Yes No Yes	....	Yes No Yes	Yes No Yes	Yes No Yes	Yes No Yes	Yes No Yes	No Yes Yes	Yes No Not benzol & toluol	Yes No	....	Yes No Yes
Electrical, Mechanical, Fine machining	.....	Heat resistant	Mechanical, Heat resistant	General purpose, Heat resistant	Electrical, Heat resistant	General purpose	General purpose, Good arc & flame resistance	Heat & arc resistance, Low dielectric loss, High insulation resistance under high humidity		.....	Excellent Electrical under high humidity

† Grade established 1954. All properties not standardized as yet. See latest revisions of NEMA Standard LP-1.

DILECTO: Continental-Diamond Fibre Div. of The Budd Co., Inc.
MICARTA: Westinghouse Electric Corp.
TAYLOR LAMINATES: Taylor Fibre Co.

FORMICA: The Formica Co.
SPAULDITE: Spaulding Fibre Co., Inc.
TEXTOLITE: General Electric Co.

INSUROK: The Richardson Co.
SYNTHANE: Synthane Co.

Final table scheduled for a forthcoming issue is: Laminated Sheet Insulation Not Covered by ASTM-NEMA Grade.

Compiled jointly for use in Electrical World and subsequent editions of Standard Handbook for Electrical Engineers.

Street Lighting Modernization Uses Old Poles

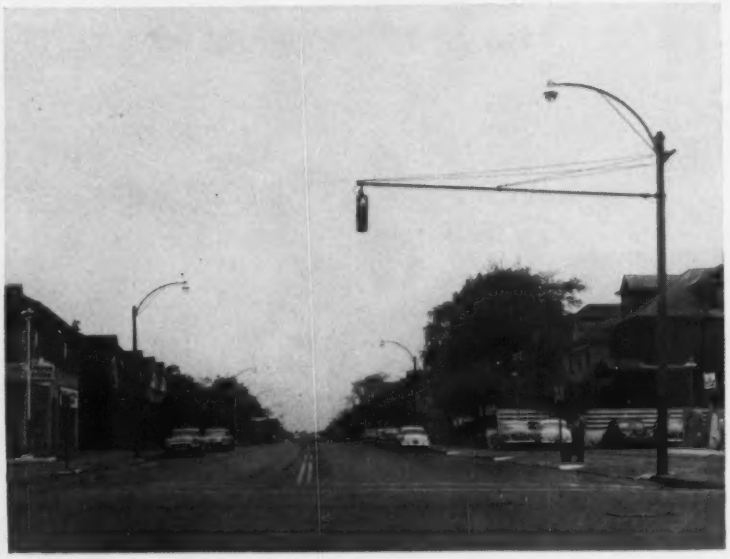
• Revamps trolley-lamp supports for economical improvements and joint use with traffic signals

FRANK J. SCHMITT, Director of Street Lighting, Rochester Gas & Electric Corp, Rochester, N. Y.

Use of rehabilitated poles which had been used for combined trolley wire and street lighting was an important economy in the Rochester Gas & Electric Corp's modernization of municipal street lighting.

The "before" and "after" photos illustrate the utilization of these poles. The modernization of 10 miles of streets in the original group of streets having nearly 15 miles of trolley-lamp poles has been completed. Effective lighting improvements range from 50 to 200%, most of them at very nominal or practically no increase in cost to the city.

Before modernization, East Main looked like this . . .



. . . after modernization, appearance was improved

Poles Appear Uniform

In many instances where the trolley-lamp poles were arranged in opposite manner the relighting was accomplished by the use of every other pole, in staggered arrangement. On most of these poles the original luminaires were open type with lamp sizes ranging from 2,500 to 10,000 lumens. The improved system employs all refractor globe type luminaires, lamp sizes ranging from 6,000 through 10,000 lumen to the 20,000-lumen mercury vapor sources.

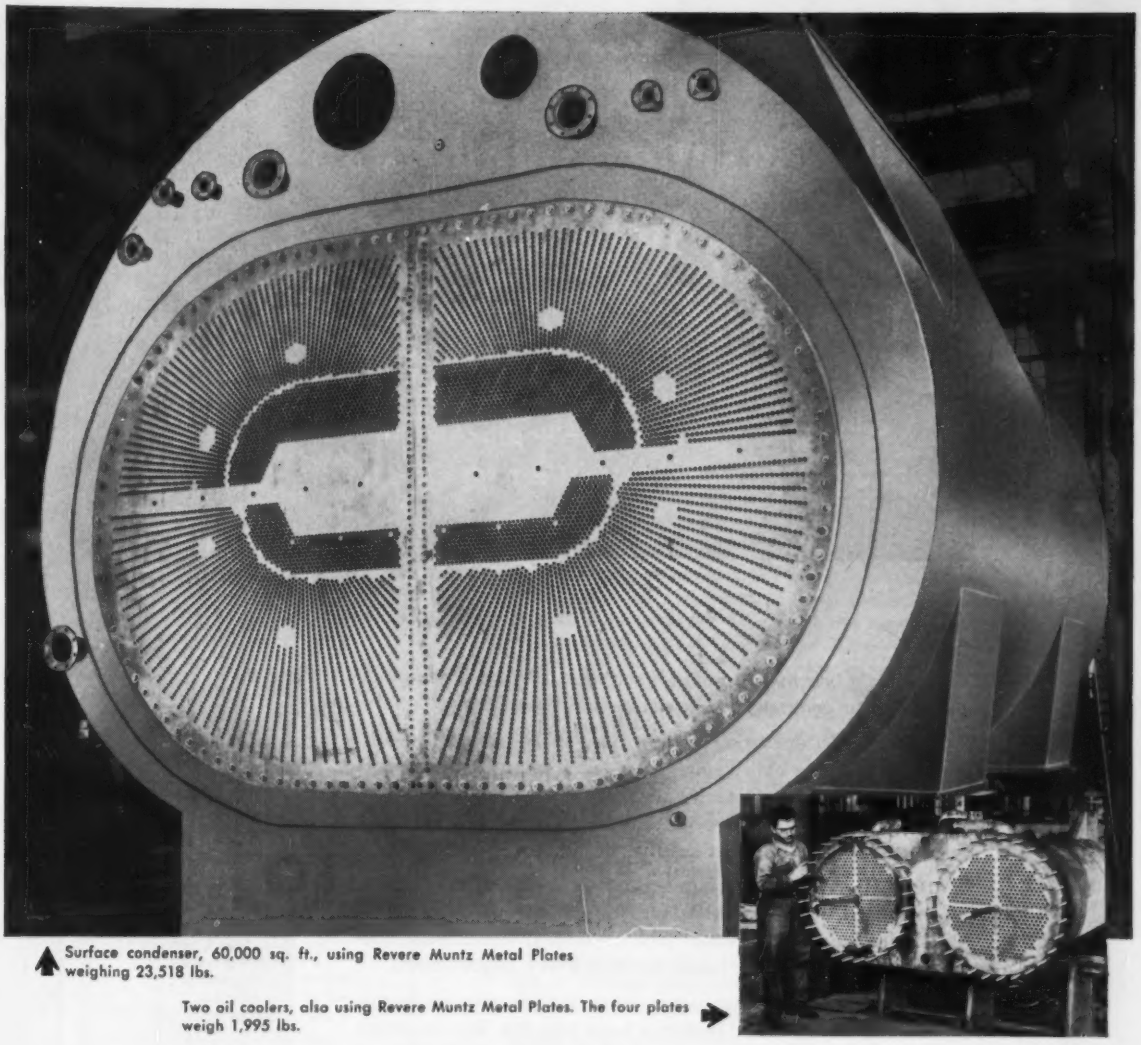
The trolley poles salvaged were put into first-class condition and installed on streets partially served by trolley-lamp poles where they preserve uniform street appearance. Besides the cost and time saving from modernization of the trolley-lamp poles on the spot, the city has benefited by having better looking streets. This also was an objective of the program for providing the convenience and safety of better lighting and keeping company and city costs down.

Joint Use With City

The city has benefited further by using these poles in its traffic signal modernization program. These sturdy poles provide good support for long-boom type arms from which the signals are suspended. The company has cooperated with the city in combined pole use at many intersections. Now four poles do the job of lighting the corners and supporting traffic control signals, instead of as many as eight heretofore.

In the decade since 1945 the company increased its municipal street lighting contracts from 108 to 140 and now serves these communities with a total of 31,000 street lamp fixtures. The entire system is owned and operated by the utility. For modernization and improved replace-

(*Continued on page* 204)



▲ Surface condenser, 60,000 sq. ft., using Revere Muntz Metal Plates weighing 23,518 lbs.

Two oil coolers, also using Revere Muntz Metal Plates. The four plates weigh 1,995 lbs. ➡

LARGE PLATES FOR CONDENSERS

. . . SMALL FOR OIL COOLERS

REVERE SUPPLIES THEM BOTH!

These two pictures offer a great contrast in the size of the equipment. The large condenser has 60,000 square feet of surface, the small oil coolers only 1,100 square feet. Both were made by Westinghouse Electric Corporation, Steam Division, Philadelphia, Pa., for the Columbus & Southern Ohio Electric Co., Columbus, Ohio. Revere supplied 23,518 lbs. of Muntz Metal plates for the condenser. There are four plates, 113½" x 153" x 1¼" thick, hot rolled and leveled, cut to pattern. The oil coolers required four Muntz Metal circles, weighing 1,995 lbs. Two are 35¼" in diameter and 1¾" thick, and two are 31¾" in diameter by 2" thick. The units are for the utility's Picway generating station, for use with a 100,000 kw. turbo-generator.

Revere supplies condenser and heat exchanger plates and tubes in all the usual alloys, including not only Muntz Metal, but Admiralty Metal, Aluminum, Bronze and Brass, and Cupro-Nickel. The latter is especially advisable for difficult water conditions, such as salt, brackish or heavily contaminated water. Selection of the correct alloy to meet actual operating conditions may at times be a problem. Consult Revere. We will be glad to collaborate on such matters, and recommend the alloy most likely to serve long and economically. See the nearest Revere Sales Office.

FREE. Send for your copy of the informative booklet, "Life Extension for Condenser Tubes." Contains much basic technical as well as practical information for designers and plant operators.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

New Bushing Standards Can Save You Thousands of Dollars!

Radical Reduction of Large, Idle— And Still Inadequate—Replacement Inventories Is An Immediate Prospect.

Exploit *only one minor detail* of the new ASA bushing standard, and your company can save sizeable thousands of dollars.

At any given operating voltage, two spare bushings — no more — will cover every emergency requirement and, if necessary, will serve satisfactorily until the exact replacement is available. In many cases, especially with circuit breakers, the spare will be a permanent substitute.

Consider the saving in inventory dollars this represents. Furthermore, even with the large miscellaneous bushing replacement stocks that were once necessary, there were still many cases when these failed to meet every requirement.

Granted, this must be a slow evolution, as present equipment using non-standard bushings has a long life. But two steps can be taken now. First, establish the ASA standard for new equipment, and thus get going on the right track toward eventual improvement. Second, survey present equipment and see, if with minor adaptations, whether a reduced emergency inventory can now be instituted with new standard designs. Being smaller in size, these new bushings often present such an opportunity.

But, with all the virtues of standards, don't forget that service life, design refinements, and manufacturing experience *are not a part of these standards!* Factors that really measure your money's worth are still in open competition. Look carefully at the new O-B bushing, evaluate its fine design and construction, consider its background of over fifty very successful and progressive years in the bushing business. Specify a bushing that not only meets the new industry standard but also meets *O-B's standard* for building the best bushing of its time — always!

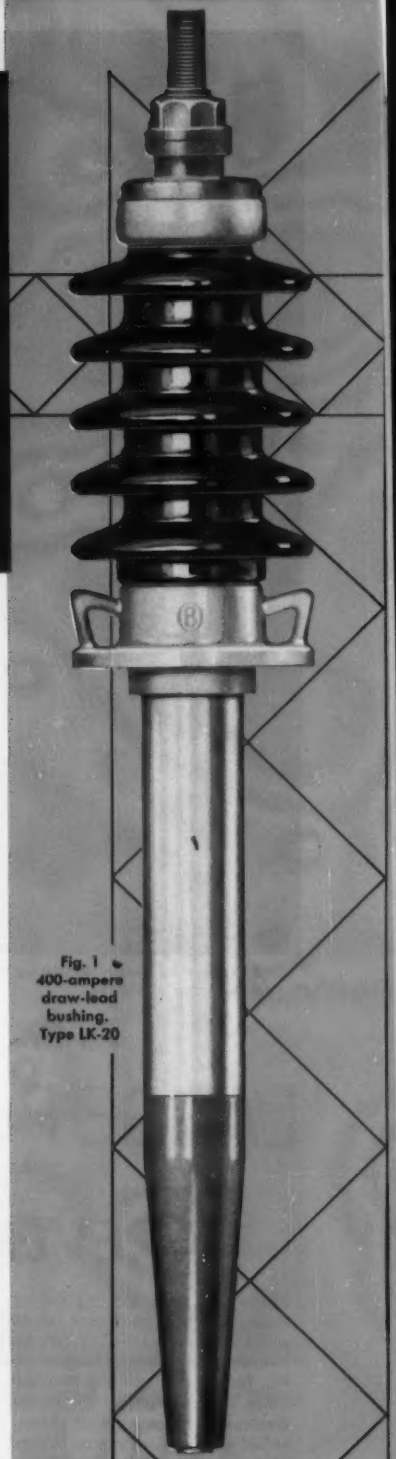


Fig. 1 400-ampere draw-lead bushing. Type LK-20

FIGURE 1

Fig. 2
1200-ampere
solid-conductor
bushing.
Type LK-20

Some Brief Studies of ASA Standard Bushing Interchangeability at 34.5 KV

Significant Catalog Data

Catalog Number	Fig. No.	Conductor	Oil Level	Length Below Flange
45119	1	Draw-lead	10"	18½"
45120	1	Draw-lead	16½"	25"
45121	1	Draw-lead	21"	29½"
*45146	2	Solid-conductor	16½"	31½"
45147	2	Solid-conductor	21"	32½"
45148	2	Solid-conductor	27"	38½"

Indicates single ASA Standard for circuit breakers.

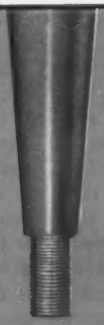


FIGURE 2

CASE NO. 1

Assume all transformers use 400-ampere, ASA Standard draw-lead bushings (Fig. 1), some with 10-inch, some with 16½-inch, and some with 21-inch oil levels. One bushing, Catalog No. 45121, will serve as a replacement. It will fit permanently where the oil level is 21 inches. For emergencies, a simple spacer or "chimney" 4½ inches or 11 inches long will raise it temporarily above the case of transformers if internal arrangements will not permit the extra extension. Otherwise no harm will be done by the bushing being emersed deeper in the oil. All other dimensions are interchangeable. The correct replacement can be made at later convenience. One more bushing, Catalog No. 45146, (Fig. 2) solid-conductor, 1200-ampere, 16½-inch oil level, will fit permanently for all circuit breaker replacements, as there is only one standard.

CASE NO. 2

Assuming ASA Standard transformers with draw-lead bushings, and oil levels of 10, 16½, and 21 inches, plus standard circuit breakers equipped with solid-conductor bushings and 16½-inch oil level — is there a single bushing that could serve as an emergency replacement? This is a possibility, using a 21-inch solid-conductor type. Spacers would be needed to adapt this to apparatus using shorter bushings. The one problem involved would be making temporary lower-end connections in transformers while the solid-conductor type was substituting for the regular draw-lead model. If this detail can be worked out satisfactorily, it would permit a minimum investment in replacement stocks, and a little trouble in making the adaption might be discounted by the infrequency of the operation.

CASE NO. 3

A less frequent but ideal situation would be the specification of all transformers to contain ASA Standard bushings, Catalog No. 45146, 1200-ampere, solid-conductor, 16½-inch oil level. These would then correspond exactly with the single circuit breaker standard. One stock bushing, in this case, would constitute a permanent replacement for all equipment.

CASE NO. 4

In the course of the past 30 years, a wide variety of transformers and circuit breakers has been put into service. To a considerable degree, bushings are not interchangeable. Based upon the importance of loads and some calculated risk, a stock of replacement bushings is available for a majority, but not all, of the equipment. Must this replacement stock be maintained in the face of increasing scarcity and still higher costs of old bushing models? . . . New ASA Standard bushings are much smaller in diameter than older equivalents. They can be mounted on tanks by means of adapters to adjust flange dimensions. Some vertical compensation may be needed, in the form of a spacer or "chimney." These simple pieces of metal work will permit adoption of the new standard for many replacement items. In some cases, the adoption can be complete — in others, partial. It will require a careful survey of equipment dimensions, and then judgement as to the most economic practice. It may develop, however, that worthwhile inventory savings and more complete emergency protection can be effected.

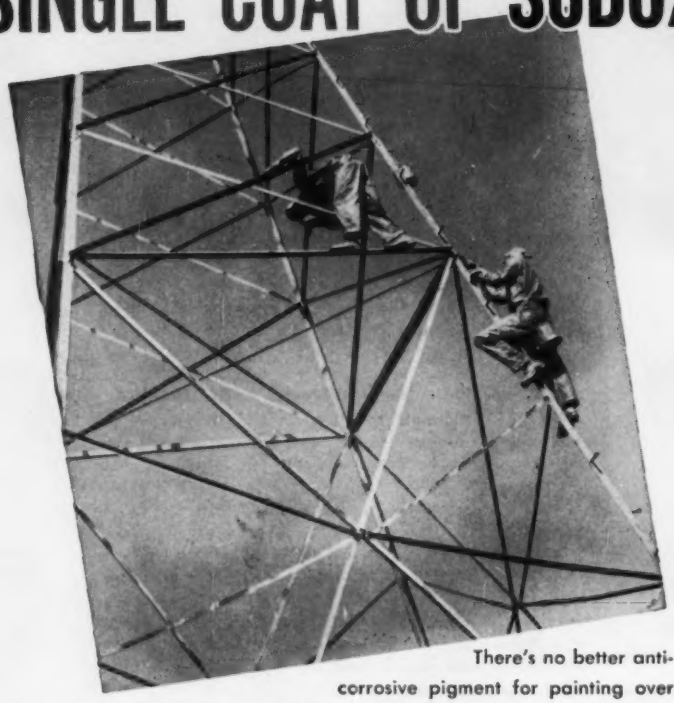
4638-H

TECHNICAL COMPETENCE
the heart of every Ohio Brass bushing

Expect 5 to 8 YEARS protection

for galvanized towers from a

SINGLE COAT OF SUBOX



There's no better anti-corrosive pigment for painting over galvanizing than active suboxide of lead—the basic pigment in Subox and Subalox paints.

There's no surer way to get economical and effective preservation of galvanized structures than by coating them with Subox or Subalox. In most instances, a single coat is sufficient and Subox or Subalox—will not chip, crack or blister during years of exposure to the elements.

What's more, repainting is simpler and more economical when these paints are used. They cost no more than any good paints, and can be relied on to save you money for years.

Write For A Free Copy of "Corrosion Control of Electrical Structures and Equipment"

Subox Inc.

3 FAIRMOUNT PLANT
HACKENSACK, N. J.

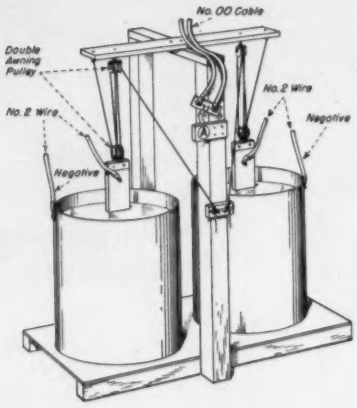
Street Lighting

(*Continued from page* 200)

ments, exclusive of new installations, the company has spent nearly $400,000 during the past five-year contract term.

A conspicuous result of the modernization program is reduction of the once prominent 1,000-lumen lamps to a number where they now represent less than 12% of the total.

SUBSTATION—Testing



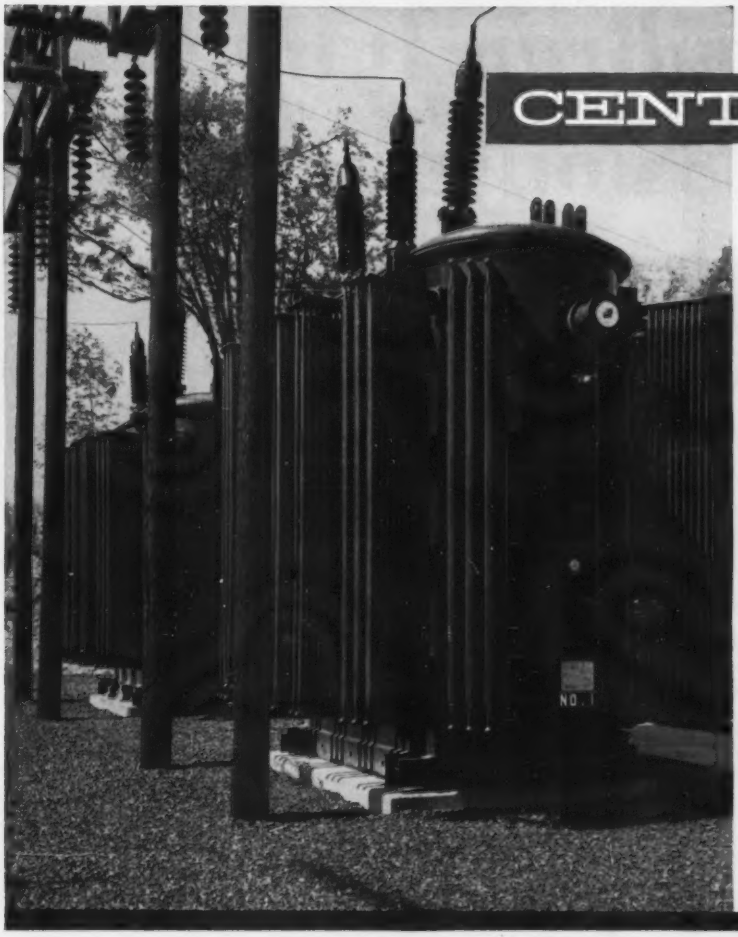
Do-It-Yourself Rheostat Tests Battery Condition

A simple and inexpensive water rheostat has been designed by Gould-National Batteries, Inc., Trenton, N. J., for use with test discharging batteries in determining battery condition.

Standard 55-gal steel drums, filled with salt water, are the principal resistance elements. The water-barrel rheostat can replace more expensive metal resistance grids, or can be used in combination with small metal grids.

A wooden scaffold supports the metal bars immersed in the water, and these bars are raised or lowered by awning pulleys to vary the resistance. The barrel is always made the negative and is connected to the negative terminal of the battery under test. The metal electrode is the positive. The bottoms of the drums should be covered with a non-conductor so that the electrode cannot touch them. The barrel is filled with

(*Continued on page* 208)



CENTRAL

power transformers help speed construction of St. Lawrence power project

2 10,000 KVA, 3-phase 115 KV to 13.8 KV Central transformers now in service at Polley's Bay Substation, Massena, N. Y. Uhl, Hall & Rich, Boston, Mass., engineers for St. Lawrence Project.

Designed, manufactured and tested in Central's modern plant for the New York Power Authority, these Central transformers are furnishing power for the construction of the gigantic St. Lawrence Power Project.

No matter what your requirements may be, there's a precision-built Central transformer to fill them to your complete satisfaction. We welcome your inquiries.

a type for every need . . . from the smallest to the largest

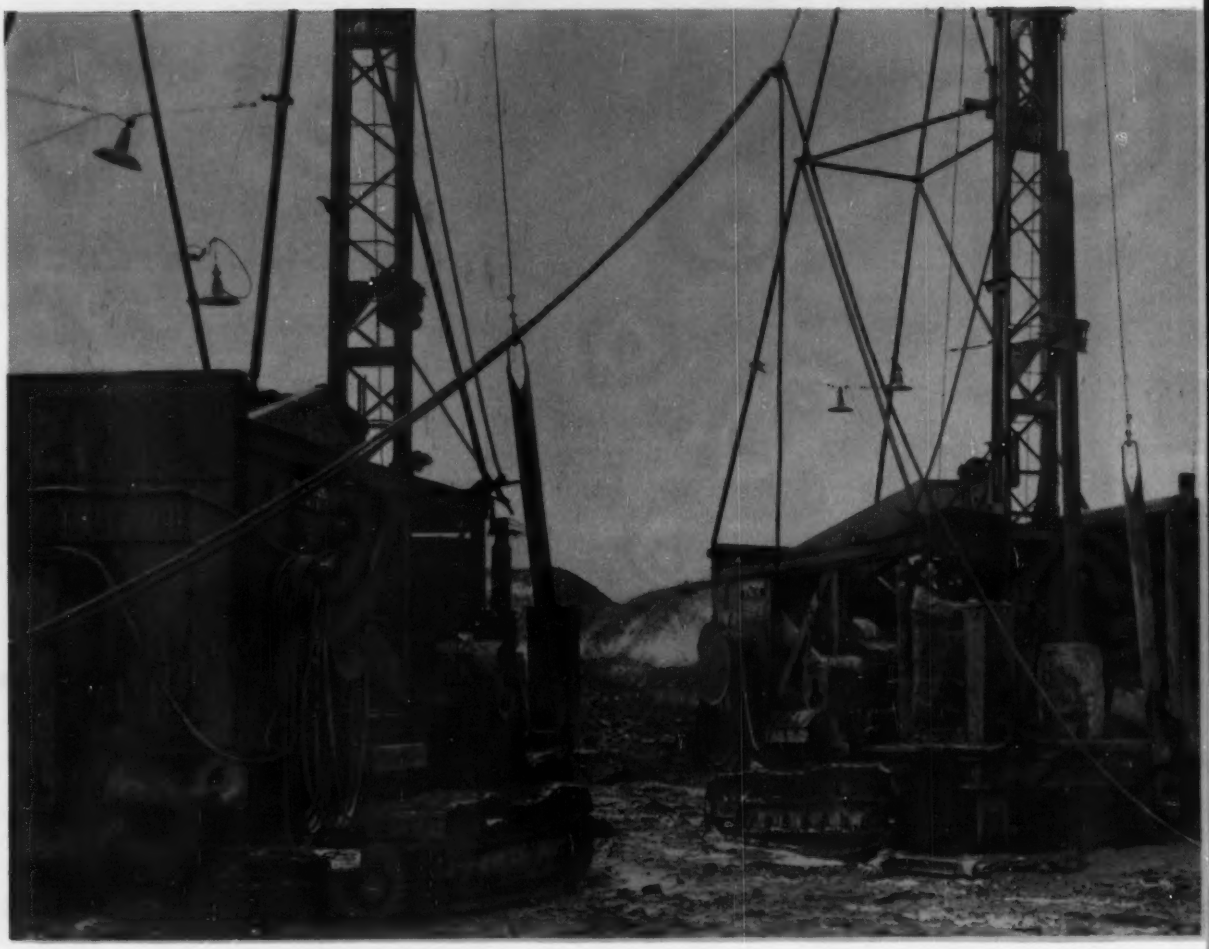
DESIGNERS AND MANUFACTURERS OF TRANSFORMERS ONLY

CTC NEMA

Sales offices in principal cities
PINE BLUFF, ARKANSAS

Central

Tiger Brand Amerclad
in this



Extra flexible welding cable is shown. Fine stranded construction eases strain on operators' wrists.

Notice the flexibility. Tiger Brand is easy to handle.

does the three big jobs high production strip mine

Imagine the worst possible environment for electrical cable, and you'll find it at the strip mine shown in these pictures. The operators are plagued with underground fires, so severe that they have ruined the plastic windows in some of the power shovels. The rocks get so hot that you can't touch them or walk on them.

Despite the heat, the Tiger Brand Amerclad cable lies on the ground day in and day out, delivering dependable power 21¾ hours every day.

They do a lot of blasting at this mine, too. Although they try to protect the cable, it is pounded by large, sharp rocks almost every time there is a blast. Yet, when the pictures were taken, all the original cable was still in use, after *12 solid years of service.*

The mine owners point out that when a cable fails it costs money in down-time and replacement. The clincher is this: every foot of shovel cable, welding cable and drilling cable in the mine is Tiger Brand Amerclad.

Roughhouse service. That cable slung in the air and coiled on the sides of the drills is all Tiger Brand Amerclad.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL
GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- asbestos wire and cable
- paper & varnished cambric cable
- mold cured portable cord
- machine tool & building wire
- shovel & dredge cable
- special purpose wire & cable
- aerial, underground and submarine cable

USS Tiger Brand **ELECTRICAL WIRE & CABLE**

UNITED STATES STEEL

A Completely NEW

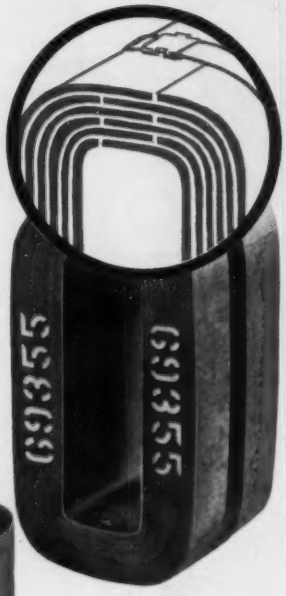
WOUND-CORE

FOR DISTRIBUTION TRANSFORMERS

BY R T & E Co.

A COMBINATION OF THE ★BEST CORE FEATURES

- ★ LOW LOSS
- ★ LOW EXCITING CURRENT
- ★ LIGHT and COMPACT
- ★ PERMANENT CHARACTERISTICS
- ★ EASY TO RE-ASSEMBLE



BETTER BECAUSE!

Because R T & E's NEW CORE is made of grain-oriented cold-reduced steel, without joint bulges—Low losses and low exciting currents are combined in a light compact core.

Because R T & E's NEW CORE has staggered butt-joints, lap secured on each side—Gap growth is eliminated, performance characteristics stay permanent and the core stays quiet.

Because R T & E's NEW CORE is made of single-turn loops of laminations — the core can easily be taken apart and put together again without special tools for maximum repair benefits

R T & E Co.

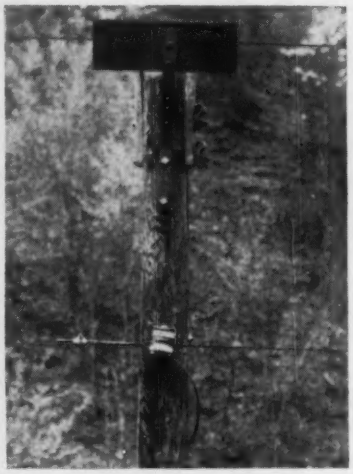
WAUKESHA WISCONSIN

(*Continued from page* 204)

fresh water into which is mixed 10 lb of salt.

An ammeter and switches are placed in the circuit according to the user's requirements and convenience

DISTRIBUTION—Maintenance

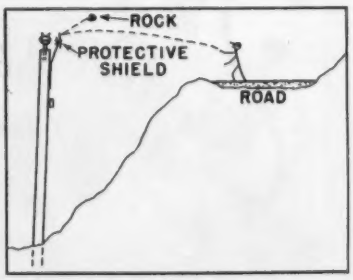


PROTECTIVE SHIELD was made from sheet iron and a transformer hanger

Sturdy Shield Protects Insulators from Vandals

BERT M. NUCKOLLS, Area Supervisor, Appalachian Electric Power Co, Grundy, Va.

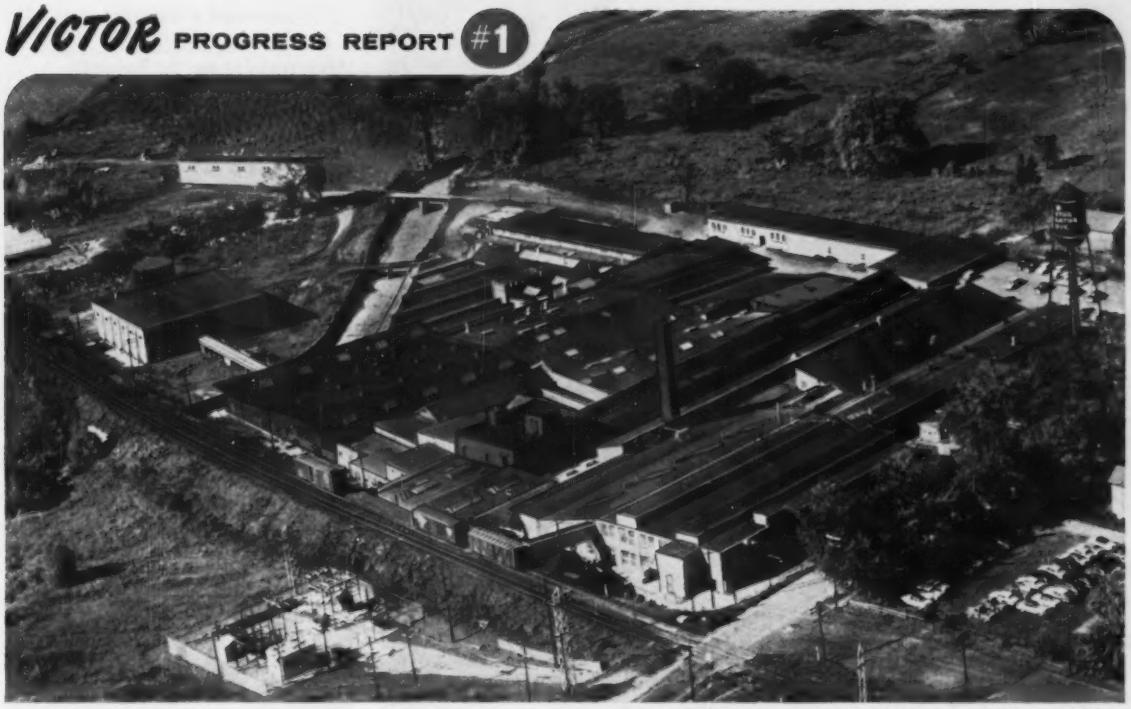
A sturdy shield has stopped vandals from breaking insulators on a pole 20 miles out on one of Appalachian Electric Power Co's lines. This preventative measure has eliminated one cause of service interruptions and the expense of replacing insulators.



The pole is at the bottom of an embankment, the double ridge-pin insulators being on the same level as the road. Thus, insulators were an inviting target for persons on the road who

(*Continued on page* 210)

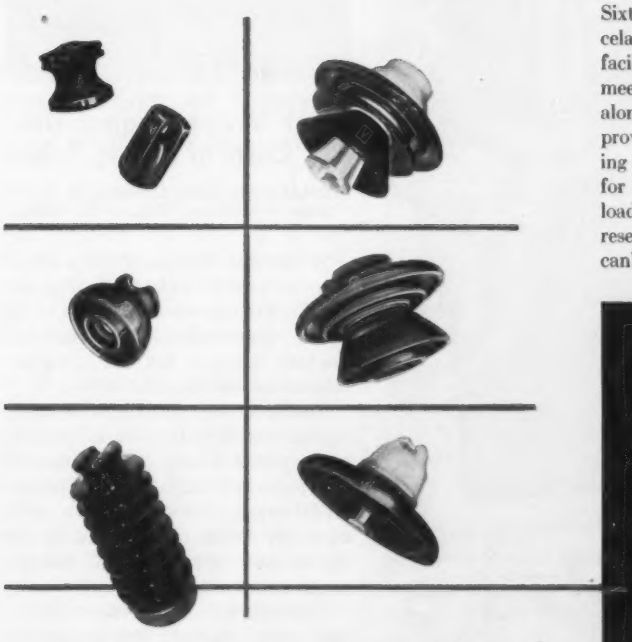
VICTOR PROGRESS REPORT #1



Portion of Victor plant outlined in red has been added since 1948.

VICTOR expands plant area 20%

TO MEET INCREASED INSULATOR DEMAND



"BETTER INSULATORS THROUGH RESEARCH"

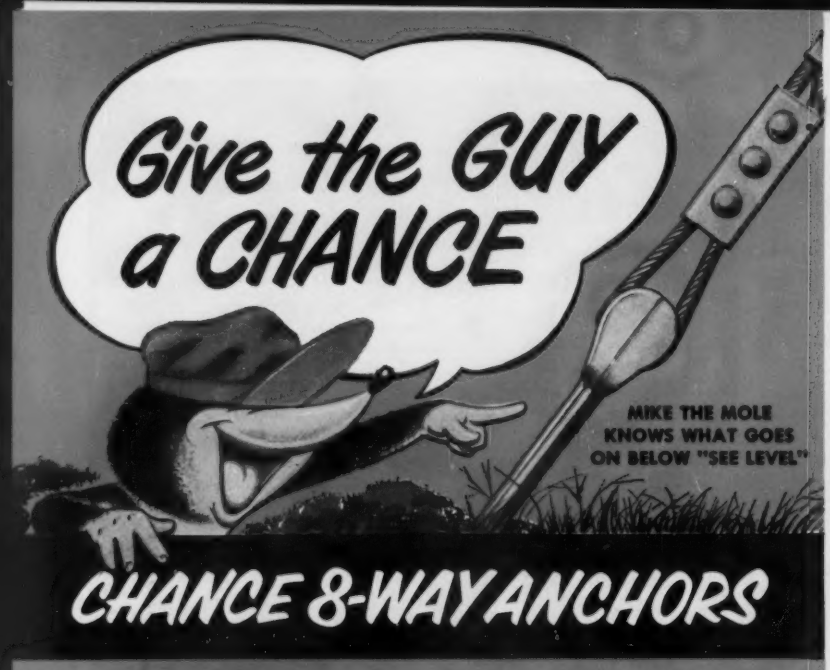
Sixty-three years ago the manufacture of wet process porcelain insulators began at VICTOR. Since then, the plant facilities at VICTOR have had to expand continually to meet increased demand. In fact, during the last seven years alone, VICTOR has had to enlarge its plant area 20% to provide greater facilities for switch and bus insulator, bushing and special porcelain manufacture, raw material storage, for new ceramic and electrical laboratories and in-plant loading docks. VICTOR'S modern plant, engineering and research facilities are unsurpassed in the industry! You just can't buy better insulators!

SPECIFY VICTOR

Purified Porcelain Insulators!

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware



CHANCE 8-WAY ANCHORS

It's not surprising that in every field test the Chance 8-Way Expanding Anchor holds more than its rated load because its design just makes common sense. *Eight* blades expand to form a pyramid shaped square —there is no wasted space between blades. The load is distributed *evenly*—all around the hole. It just seems logical that it should hold more, and it does. That's why it's on so many company standards. Your Chance Anchor Distributor can supply you from stock. Specify Chance for Service!

"ANCHORING" is the most complete guide to anchoring and guying ever developed. Shows how to choose the right anchor for every job—and how to install it *right*.

A·B·CHANCE CO·
CENTRALIA, MISSOURI
San Francisco, California
Pittsburgh, Pennsylvania

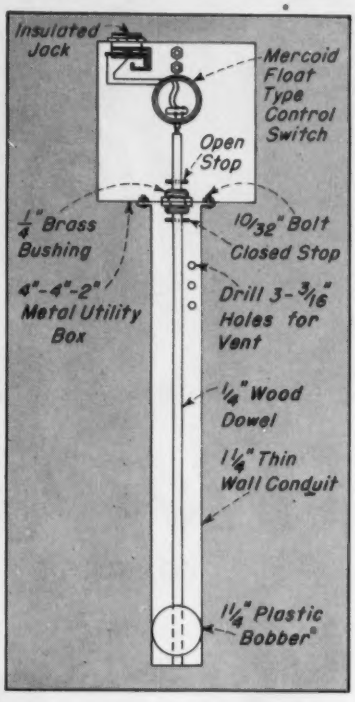
G-A56-1

(*Continued from page* 208)

threw rocks to see the flashover.

The sturdy shield made from ⅜-in. sheet iron and an old transformer hanger was bolted on the road side of the pole and grounded. It has 9-in. clearance from the 6.9-kv primary.

SUBSTATION—Operation



Float Switch, Signal Unit Cut Costs of Filling Tanks

LEONARD HICKEY, Substation Dept., Indiana & Michigan Electric Co, Marion, Ind.

A portable float switch and signal unit are used by Indiana & Michigan Electric Co to prevent overfilling of oil tanks. Because the device signals when the tank is almost full, the filling job requires one man instead of two.

The float switch, designed to hook on the rim of a tank-truck opening, has a plastic fishing bobber attached to a rod which actuates an explosion-proof switch. By means of a 30-ft cord this switch is connected to the signal unit comprising a battery, toggle switch, and buzzer.

Material for the portable device cost about $6, and fabrication required 8 man-hours.

(*More How To on page* 211)

SUBSTATION—Maintenance

Filed Cotter Pin Serves as Screwdriver, Holder

C. J. GRIMM, Tidd Plant, Ohio Power Co, Brilliant, Ohio

A filed down cotter pin is a time saver for starting small screws in tight places when a commercial grip-type screwdriver is not handy. The modified pin has been found very helpful here at Tidd Plant for maintenance work when it's equipped with a tubular handle.

The simple screwdriver was made by filing down the tips of a $\frac{1}{16}$-in. cotter pin. Resulting thin leaves fit into the slotted screw head, and spring action holds the screw securely.

DISTRIBUTION—Maintenance

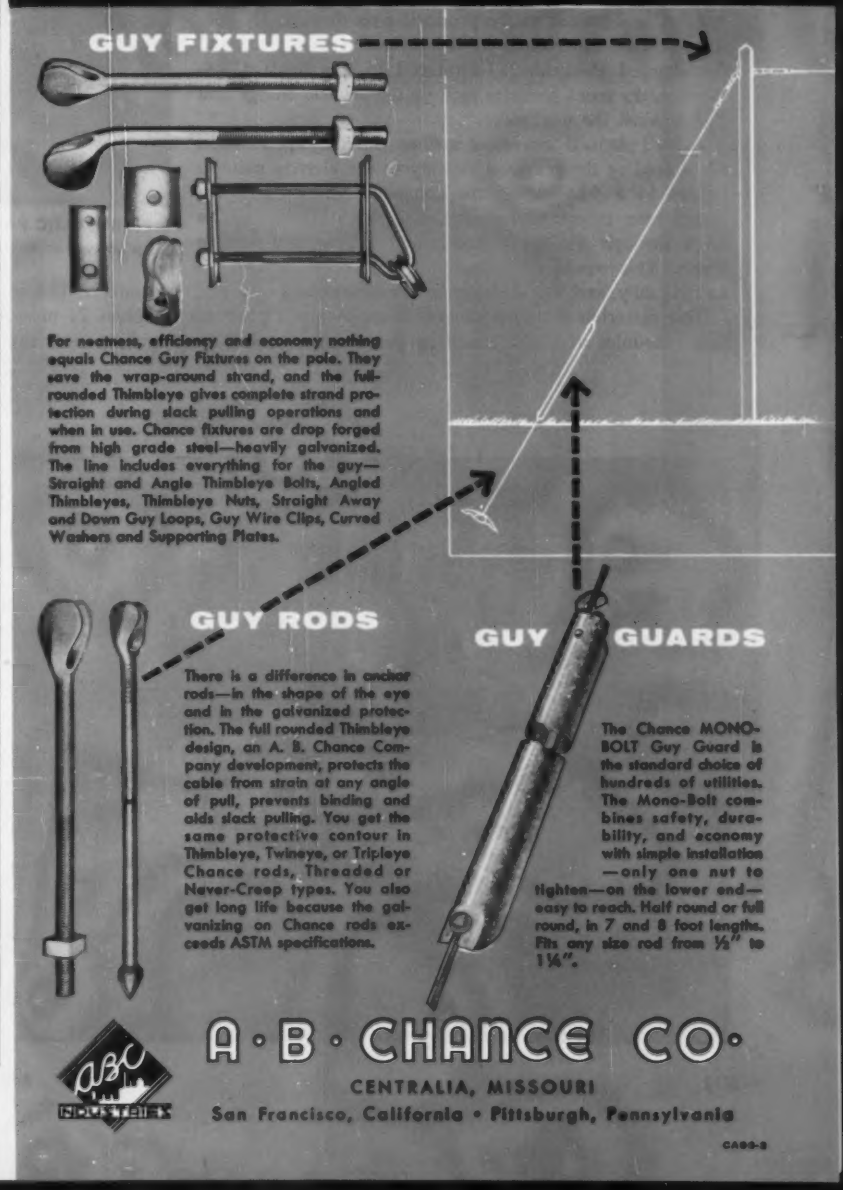
Bumper-to-Body Mudguard Assures Greater Safety

A. W. McBRIDE, Appalachian Electric Power Co, Fieldale, Va.

Galvanized mudguards between the rear bumper and body of ½ and ¾-ton pick-up trucks prevent mud, tar, and gravel accumulation on the 3-in-1 directional-signal stop lights, the registration plate, and advertising signs.

This district of Appalachian Electric Power Co has found that by eliminating the deposit better visibility of signals lights is assured, thus improving safety to personnel. Moreover, elimination of the deposit with the mudguard reduces frequency of washing the trucks, releasing men for other jobs.

The mudguards were made and installed on each truck in about one hour. To eliminate hand injuries during washings the edges of the galvanized tin guards were crimped.


GUY FIXTURES
For neatness, efficiency and economy nothing equals Chance Guy Fixtures on the pole. They save the wrap-around strand, and the full-rounded Thimbleye gives complete strand protection during slack pulling operations and when in use. Chance fixtures are drop forged from high grade steel—heavily galvanized. The line includes everything for the guy—Straight and Angle Thimbleye Bolts, Angled Thimbleyes, Thimbleye Nuts, Straight Away and Down Guy Loops, Guy Wire Clips, Curved Washers and Supporting Plates.
GUY RODS
There is a difference in anchor rods—in the shape of the eye and in the galvanized protection. The full rounded Thimbleye design, an A. B. Chance Company development, protects the cable from strain at any angle of pull, prevents binding and aids slack pulling. You get the same protective contour in Thimbleye, Twineye, or Tripleye Chance rods, Threaded or Never-Creep types. You also get long life because the galvanizing on Chance rods exceeds ASTM specifications.
GUY GUARDS
The Chance MONO-BOLT Guy Guard is the standard choice of hundreds of utilities. The Mono-Bolt combines safety, durability, and economy with simple installation—only one nut to tighten—on the lower end—easy to reach. Half round or full round, in 7 and 8 foot lengths. Fits any size rod from ½" to 1¼".
A·B·CHANCE CO·
CENTRALIA, MISSOURI
San Francisco, California • Pittsburgh, Pennsylvania
CA99-8

Electric Painting Ups Output, Saves Labor

LEON ALBERTSON, Application Engineer, Philadelphia Electric Co, Philadelphia, Pa.

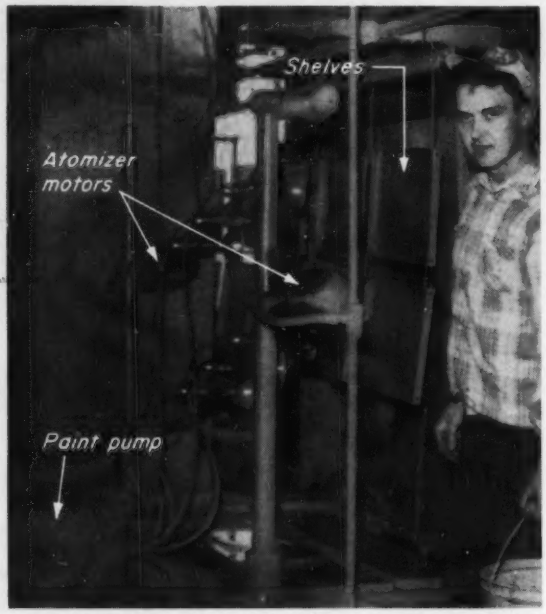
Product quality is being maintained at high standards by Alan Wood Steel Co's Penco Metal Products Div, Philadelphia, Pa., through use of electrostatic spray painting. Combined with a 1,000-ft overhead conveyor, this arrangement has stimulated output and has conserved manpower for the company.

An electrostatic spray painting rig is used to coat commercial steel lockers, shelving, cabinets, and special steel products made by the company. The process assures complete paint coverage. Corners, bends, and crevices—often missed by other painting techniques—emerge from the paint spray booth with the desired enamel coating. Quality is consistent; there is no sagging of paint; production is speeded, and paint is saved.

Paint is atomized as the products pass through an electrostatic field established by the grounded workpiece and the charged electrodes. Introduced to this field at low velocity, the paint particles pick up the electric charge and dash against the workpiece.

A well-planned conveyor system expedites production while feeding the products steadily to the electric painter. Driven by a 5-hp motor, the conveyor dunks the workpieces into cleaning and phosphate baths, then carries them through the spray booth and drying and baking ovens. This would otherwise be a back-breaking task to do manually, and would consume extra manhours.

This materials handling scheme helps maintain production schedules and is credited in part with contributing to safety. The entire processing system is automatic and involves 21 motors for pumps, blowers, and compressors, totalling more than 100 hp.



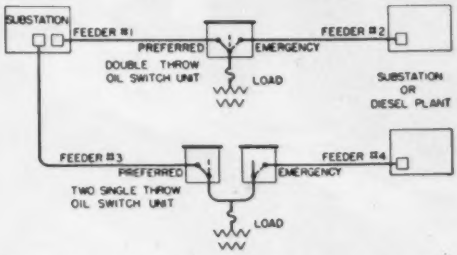
ELECTROSTATIC PAINT spray booth is compact and efficient. 5-hp conveyor carries shelving from booth to baking ovens

Two-Way Radio Directs Thread Mill's Fork Trucks

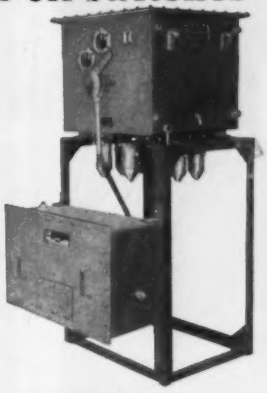
Two-way radio has been installed on five trucks in a thread mill owned by Coats & Clark, Toccoa, Georgia. The system cost $3,000 but it obviated one more fork truck and driver, and paid for itself in less than a year. The foreman in the plant's central control room can locate, dispatch, call in, broadcast instructions to any of the truck operators when a large trailer arrives. Thus, all five mobile units can be marshalled at the receiving platform in a matter of seconds.

INSURE SERVICE CONTINUITY

with G&W Automatic transfer oil switches

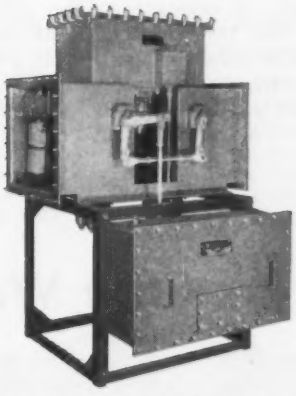


- When preferred feeder voltage fails, the load is automatically transferred to the emergency feeder.
- When preferred feeder voltage is restored (for a period of ¾ minute) the load is automatically returned to the preferred feeder.
- There is no "hunting" on system disturbances. Load cannot be thrown to a "dead" source.
- Model "F6" automatic mechanism provides for remote operator selection of either feeder as the "preferred."

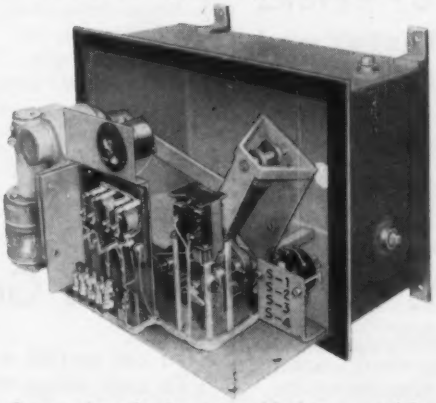


Type "RAD" double throw oil switch unit with Model "F" automatic mechanism.

Model "F" Operating Mechanism



TYPE "DRA" two single throw oil switch unit with Model "F" automatic mechanism. Air filled isolating link box on top.



Improved mechanism removable from watertight case. Motor compresses spring which, when released through action of relays and solenoid, operates the oil switch.

The automatic mechanisms are applied to various forms of Type "RA" oil switches, either for underground cables or overhead connections—up to 23 Kv., 400 amperes. All control wiring is done at the factory. Installation of the unit merely involves connection of the feed and load cables or wires.

Send for Bulletin DA-F which fully describes Model "F" mechanism.

G&W ELECTRIC SPECIALTY CO.

7780 Dante Avenue, Chicago 19, Illinois, U.S.A.

Representatives in principal cities of U.S.A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

D561

Pat. Pend.

*KLEIN KUT PLIERS
for both regular and heavy-duty cutting

It was Klein that produced the first and still the finest regular side-cutting plier. Klein also gave the industry the modern, streamlined version so much in demand.

And it's Klein again with a new, high leverage cutting plier for light- or heavy-gauge wire, including No. 2 weatherproof hard drawn solid copper wire, and A.C.S.R.

There's no extra hinging of any kind—no uncomfortable wide-spread handles—with this new Klein-Kut Plier. The offset hinge permits the extra-high leverage and operation is as smooth and easy as with any other Klein Plier. Forged from high-grade tool steel, individually fitted, tempered, adjusted and tested. Ask for No. 213-9 N.E. for streamlined pattern.

Regular pattern available
Same high-leverage design, but in the original Klein side-cutting pattern. Ask for No. 213-9.

Write for free Copy of Bulletin 1054

*Trade Mark

ASK YOUR SUPPLIER
Foreign Distributor: International Standard Electric Corp., New York.

"Since 1857"

Mathias KLEIN & Sons

Infrared Speeds Pipe Stem Output

Softening plastic stems for corn cob pipes is being done at Hirschl Bendheim Co, Washington, Mo, with three 375-w infrared lamps suspended over the pipe stem conveyor. The lamps soften the plastic stems, preparing them for bending into final form. Formerly the stems were warmed in hot water. But electric heat has proved faster and has increased production to the rate of 1,200 stems an hour.—Robert Enkelmann, Industrial Engineer, Union Electric Co of Missouri, St. Louis.

Trucks Get Pre-Start Warmup

- **To cut engine wear**
- **To save driver time**

HOWARD L. PLAHN, Power Sales Engineer, Northern States Power Co, Minneapolis, Minn.

Diesel truck engines are getting a pre-start warmup during the winter months in the outdoor parking area operated by Consolidated Freightways in Minneapolis, Minn.

Heating is done by a head-bolt type of electric heater. These heaters are screwed into the engines and are left in place permanently.

Pre-warmup is vital in severe weather. Diesel engines cannot be started without it. At other times, it saves wear on the engine and conserves the driver's time.

Heaters are installed in bolts that are substituted for regular engine head bolts. Extension lines from convenient electrical outlets scattered about the lot are plugged to the heaters when required. This system also can be used with electric crankcase oil heaters, depending upon engine type.

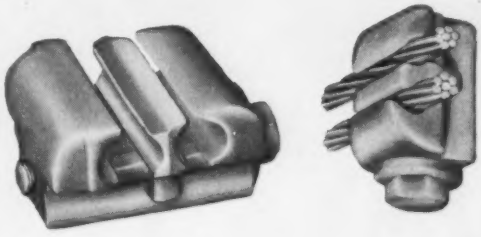
Two parking spots are equipped with a time switch which turns on the heaters 2 hr before the drivers arrive. These two drivers start work before the others. Upon arrival, they switch on the heaters in other trucks. By the time these other drivers arrive, their truck engines have been preheated so they will start easily, thereby saving time.

Consolidated Freightways' trucks roll into Minneapolis from all parts of the country. This outdoor parking area provides the flexibility needed to accommodate the varying size of the parked-overnight truck fleet.

MEET EVERY ALUMINUM NEED QUICKER, BETTER WITH

FARGO "9000" SERIES

ONE-PIECE ALUMINUM CONNECTORS

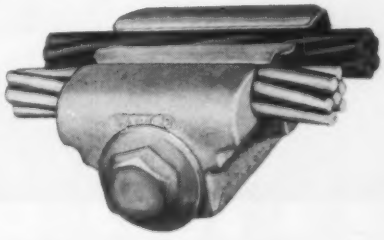


FARGO ALUMINUM CONNECTORS
for aluminum to aluminum

Featuring the unique vise type, one piece construction of all Fargo connectors, the aluminum "9000 Series" have extra width and mass. Large contact areas overcome high contact resistance inherent in alumninum . . . provide ample radiating surfaces and lower temperature rise at points of contact.

FARGO PLATED ALUMINUM CONNECTORS
for bimetal or aluminum to aluminum

These plated "9000 Series" connectors permit a substantial reduction in the number of clamps stocked . . . one clamp for aluminum to aluminum or aluminum to copper connections. Pure aluminum spacer bar insures a short high conductivity path between conductors with adequate separation. Wide parabolic jaws minimize conductor cold flow and distortion.



FARGO ALUMINUM CONNECTORS
for aluminum to copper

Transition between copper conductor and aluminum casting is provided by a bimetal insert of pressure welded aluminum and copper sheet. Wide jaws and efficient conductor encirclement bring each strand under a "pressure zone" to reduce interstrand resistance. Extra mass assures lower joint temperatures under normal or fault currents.

The aluminum body of all Fargo "9000 Series" Connectors is made of high strength, age-hardening alloy. Spacer bars are cast from soft, pure aluminum that forms snugly around conductor strands and preserves clean contact surfaces. There's a full range of standard sizes covering all sizes and combinations from #8 Solid through 500 MCM.

Ask your Line Material Field Engineer for complete details.

Manufactured by
FARGO MFG. COMPANY, INC.
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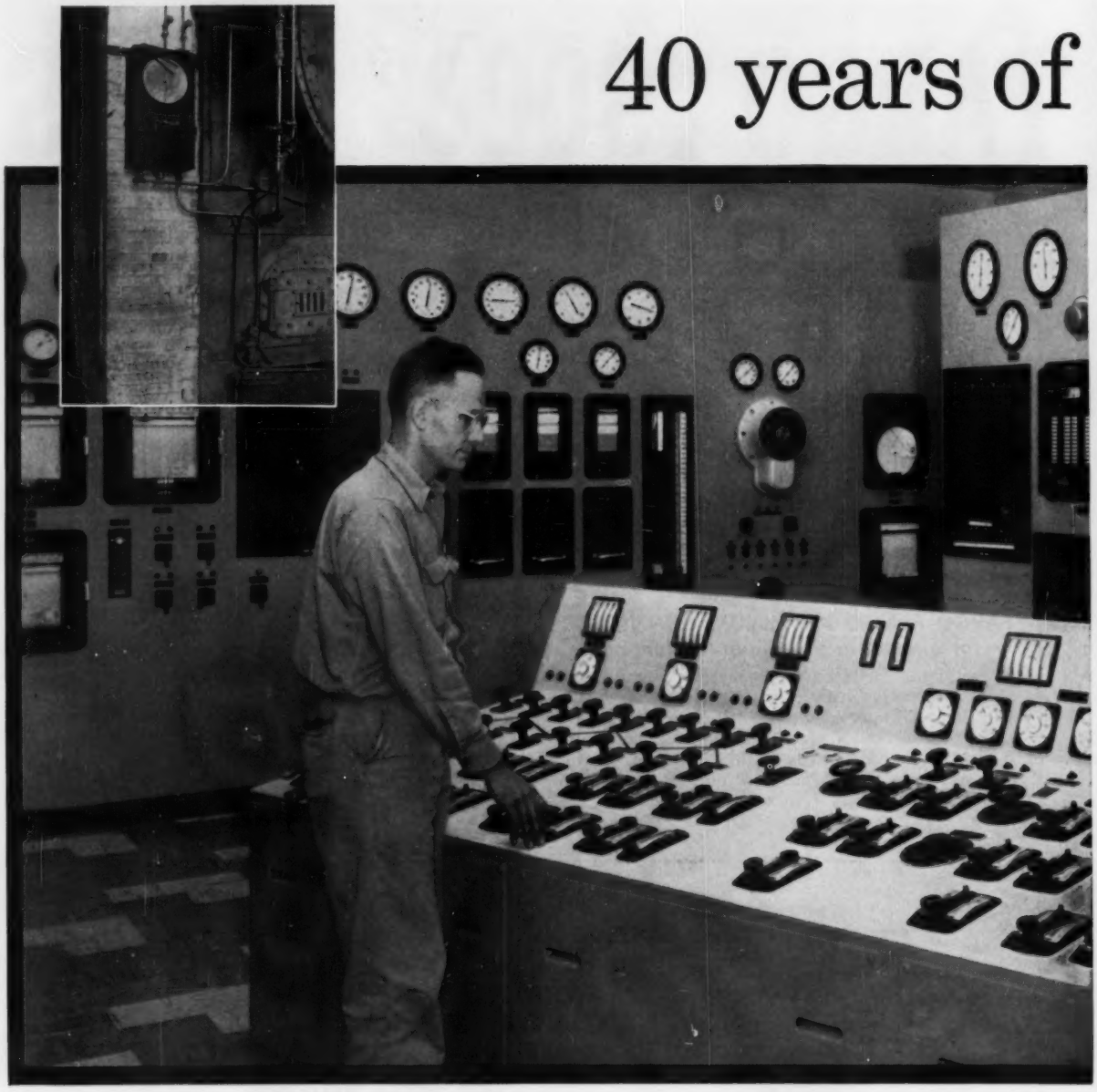
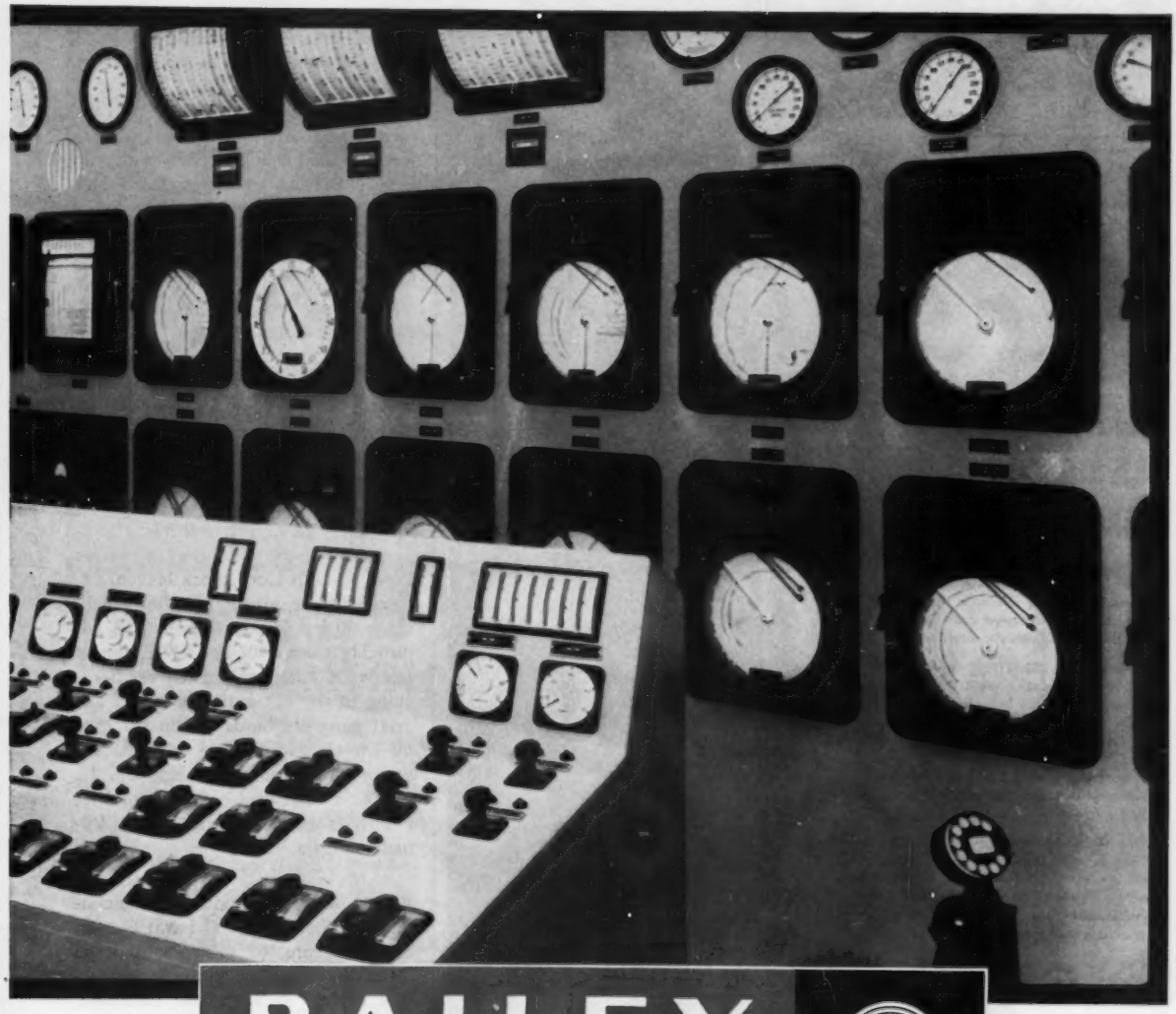
40 years of



As ASME celebrates its 75th, Bailey Meter Co. completes its 40th year . . . The contrast between the Bailey installation of 1916 and the control room of today shows 40 years' progress in boiler control. In this progress, the completeness of the Bailey line has played its part, as has the breadth of Bailey Engineering Service . . . but most important has been a steadfast service policy of *making it work. That policy is expressed today in the most widespread network of Sales-Service Engineers provided by any manufacturer of boiler control systems,* sustaining the reputation of *the company built on service.*

"MAKING IT WORK"...



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METER COMPANY
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CLEVELAND 10, OHIO
Complete Controls for Steam Plants

BAILEY METERS
Controls for
COMBUSTION
FEED WATER
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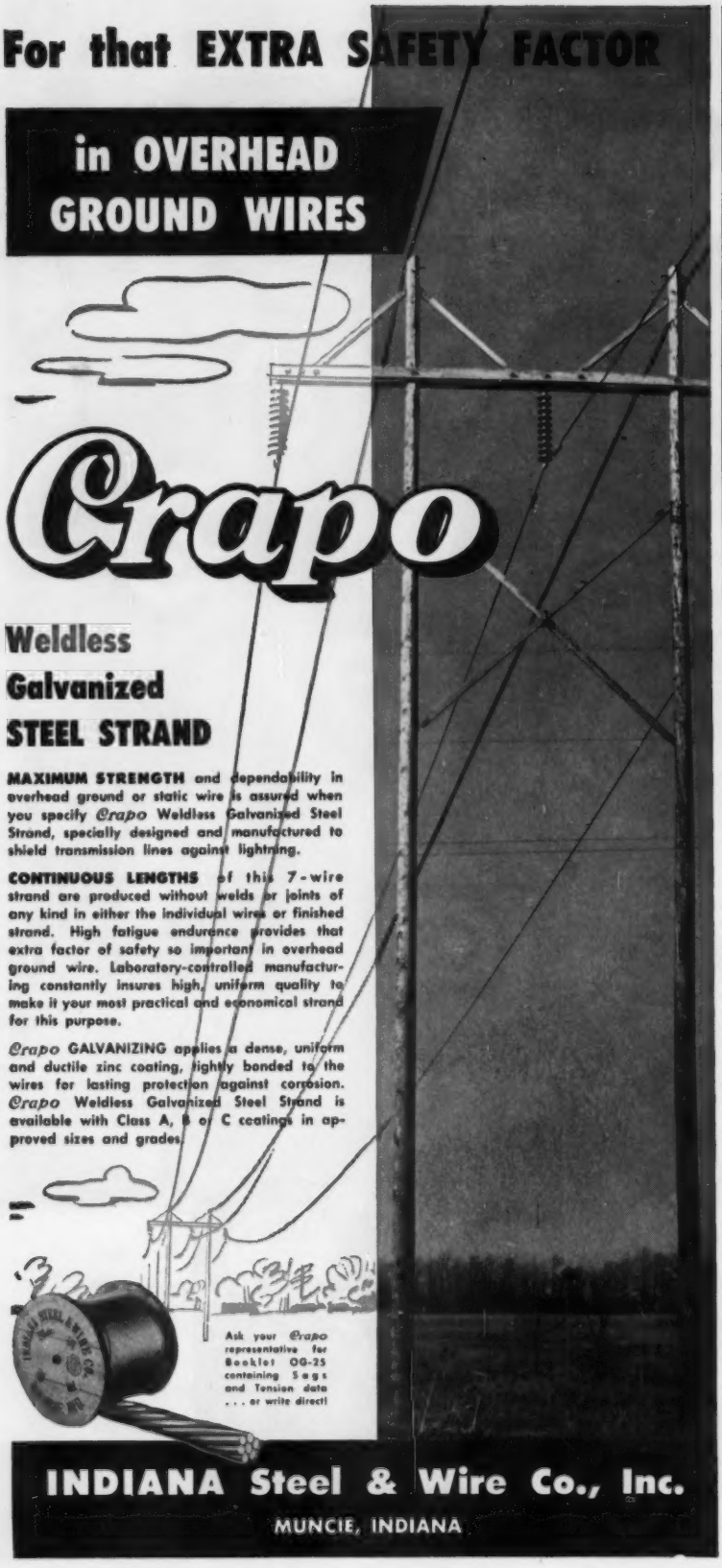
PRESSURE
LIQUID LEVEL
FEED PUMPS

A127-2

For that EXTRA SAFETY FACTOR

in OVERHEAD GROUND WIRES



Crapo

Weldless Galvanized STEEL STRAND

MAXIMUM STRENGTH and dependability in overhead ground or static wire is assured when you specify *Crapo* Weldless Galvanized Steel Strand, specially designed and manufactured to shield transmission lines against lightning.

CONTINUOUS LENGTHS of this 7-wire strand are produced without welds or joints of any kind in either the individual wires or finished strand. High fatigue endurence provides that extra factor of safety so important in overhead ground wire. Laboratory-controlled manufacturing constantly insures high, uniform quality to make it your most practical and economical strand for this purpose.

Crapo GALVANIZING applies a dense, uniform and ductile zinc coating, tightly bonded to the wires for lasting protection against corrosion. *Crapo* Weldless Galvanized Steel Strand is available with Class A, B or C coatings in approved sizes and grades.

Ask your *Crapo* representative for Booklet OG-25 containing Sags and Tension data . . . or write direct!

INDIANA Steel & Wire Co., Inc.

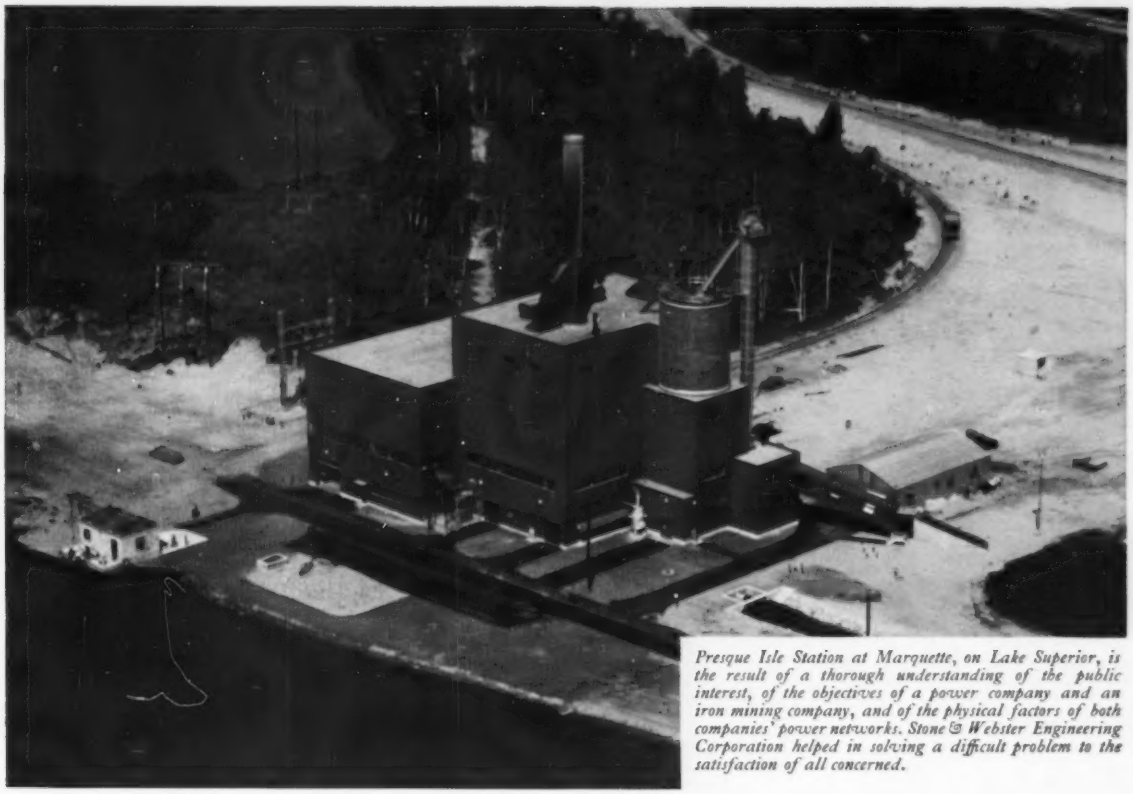
MUNCIE, INDIANA

INDUSTRIAL BRIEFS

Black light inspection of non-magnetic metal castings by the Magnetic Inspection Laboratory Co, Chicago, is saving the cost of machining these parts and eliminating faulty parts. The part is immersed in a penetrant and after it is removed the water-soluble penetrant is washed off the surface with a stream of water. A talc is applied to the casting which is then placed in an electric oven and heated to 180F. The oven has resistance heating elements and thermostatic control. When the casting is heated the penetrant is driven from the flaws to the surface. The talc aids the capillary action, helping the penetrant to return to the surface. Under the black light, defects in the casting are visible by the trace of penetrant on the surface. P. E. Peterson, Power Service Engineer, Chicago North Div, Commonwealth Edison Co, Chicago, Ill.

Hardening alloy aluminum in an electric salt bath furnace has lowered maintenance costs, eliminated holes burned in the salt bath pot by a flame, and has yielded more accurate temperature control for the operation. Piper Aircraft Corp, Lock Haven, Pa, received these advantages after installing a 90 kw furnace that can be adjusted between 840F and 910F, plus or minus 5F. After preliminary age hardening in the salt bath, the metal aircraft parts are hardened further in a 60 kw electric furnace operated between 350F and 375F. Kenneth H. Breon, Industrial Representative, Pennsylvania Power & Light Co, Williamsport, Pa.

Baking plastic films on aluminum containers is being done at Fawn Plastics Co, Baltimore, by a 39-kw rod-type infrared oven. Applied to give protection against abrasion and corrosion, the thermoplastic material is sprayed on the work which is carried through the oven by an overhead conveyor. Baking time and temperature are carefully controlled. Baffles and reflectors in the oven are adjusted to direct the heat properly against the convolutions in the work. An extremely tough, uniform coating thus is produced many times faster than was possible with a convection oven. Rejects are practically nil. G. H. Hoffman, Industrial Representative, Baltimore Gas & Electric Co, Baltimore, Md.



Presque Isle Station at Marquette, on Lake Superior, is the result of a thorough understanding of the public interest, of the objectives of a power company and an iron mining company, and of the physical factors of both companies' power networks. Stone & Webster Engineering Corporation helped in solving a difficult problem to the satisfaction of all concerned.

SOLVING THE POWER PROBLEMS ON MICHIGAN'S UPPER PENINSULA

To meet the critical demand for more power in Michigan's Upper Peninsula region, the Upper Peninsula Power Company and The Cleveland-Cliffs Iron Company retained Stone & Webster Engineering Corporation to assist in their separate expansion programs.

As a result of intensive studies and investigations of all aspects of the situation by the Engineering Corporation, it was decided to build a single jointly-owned steam power plant. Presque Isle Station was designed and built by the Engineering Corporation and is now on the line with initial installation of 22,000 kilowatts.

If you have a problem of design or construction, our broad experience in these and related fields may help you solve it. Write or call us for complete information on our services.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INC.

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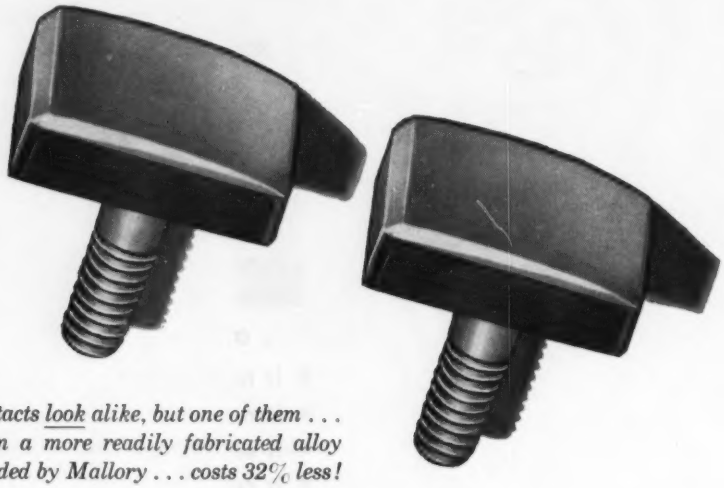
MALLORY



These contacts look alike, but one of them . . . made from a more readily fabricated alloy recommended by Mallory . . . costs 32% less!

Mallory Engineered Materials Selection Can Cut Your Contact Costs

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design** . . . for your purchasing, production and product needs.
3. **The most economical backing material** . . . from a group of Mallory alloys developed for this use.
4. **The most economical backing member design** . . . in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

CHOOSING the contact material that exactly matches your product requirements can often reduce over-all contact costs. For example, designers of a circuit breaker selected one of the Mallory Elkonite® materials for the contacts. This is a superior material for heavy-duty service, with high resistance to sticking and arc erosion.

Mallory engineers examined the product requirements . . . and recommended a change in materials. They found another ELKONITE, a higher silver content material, would give excellent performance on this medium-duty application. And because this material involved fewer manufacturing operations, the contacts could be made at lower cost. The customer's savings amounted to $10.16 per thousand . . . a total of over $8,000!

Mallory engineers are especially well qualified to help you get the best economy and performance in your contacts. They have a uniquely broad range of Mallory contact alloys from which to choose. And their extensive application experience is valuable in coordinating *all* phases of contact, backing member and assembly design to assure you of top value for your contact dollar. Write or call Mallory for a consultation on your particular application.

Expect more . . . get more from

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Serving Industry with These Products:

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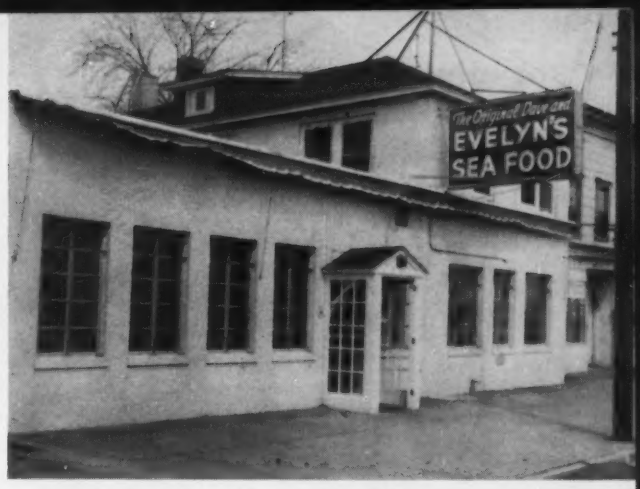
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

What Happens When a Restaurant Switches to Electric Cooking?



This one did . . . and here's what it found:

- **It now serves 15% more meals per day**
- **It needs fewer deep-fat fryers**
- **It uses little more than half as much fat**
- **It cut its air conditioning requirements from 40 to 17 tons**

SALES—Commercial

E. M. AMBLER and R. B. JENSEN, Jersey Central Power & Light Co, Asbury Park, N. J.

When a restaurant switches from all-gas to all-electric cooking, what happens? Evelyn's Seafood Restaurant, famed dining spot for lobster and fish lovers at Belmar, N. J., is a good case in point.

Because of accurate temperature controls, immersion units, and other features available only with electric equipment, Evelyn's now is able to serve about 15% more meals every day. This is as important to good will as to profits. Despite the 300 seats available, customers must wait in line to get a table.

Another example of electric cooking's efficiency is in deep fat frying. Evelyn's, like most seafood houses, specializes in fried dishes. Before installing electric fry kettles, the restaurant relied on eight gas-fired fryers, each of which used a 50-lb supply of fat. With electric fryers, however, only seven units do the same job. And they use only 28 lb of fat each—little more than half the amount required with gas. Moreover, Evelyn's discovered that fat lasts an average of two days longer in electric than in gas fryers. With beef fat costing about 13¢ a lb, the savings here alone are expected to more than pay for the equipment in a short time.

"FAR SUPERIOR TO GAS in every test," says restaurant's owner-manager, Evelyn Longstreet. Included are seven electric deep fat fryers and battery of broilers

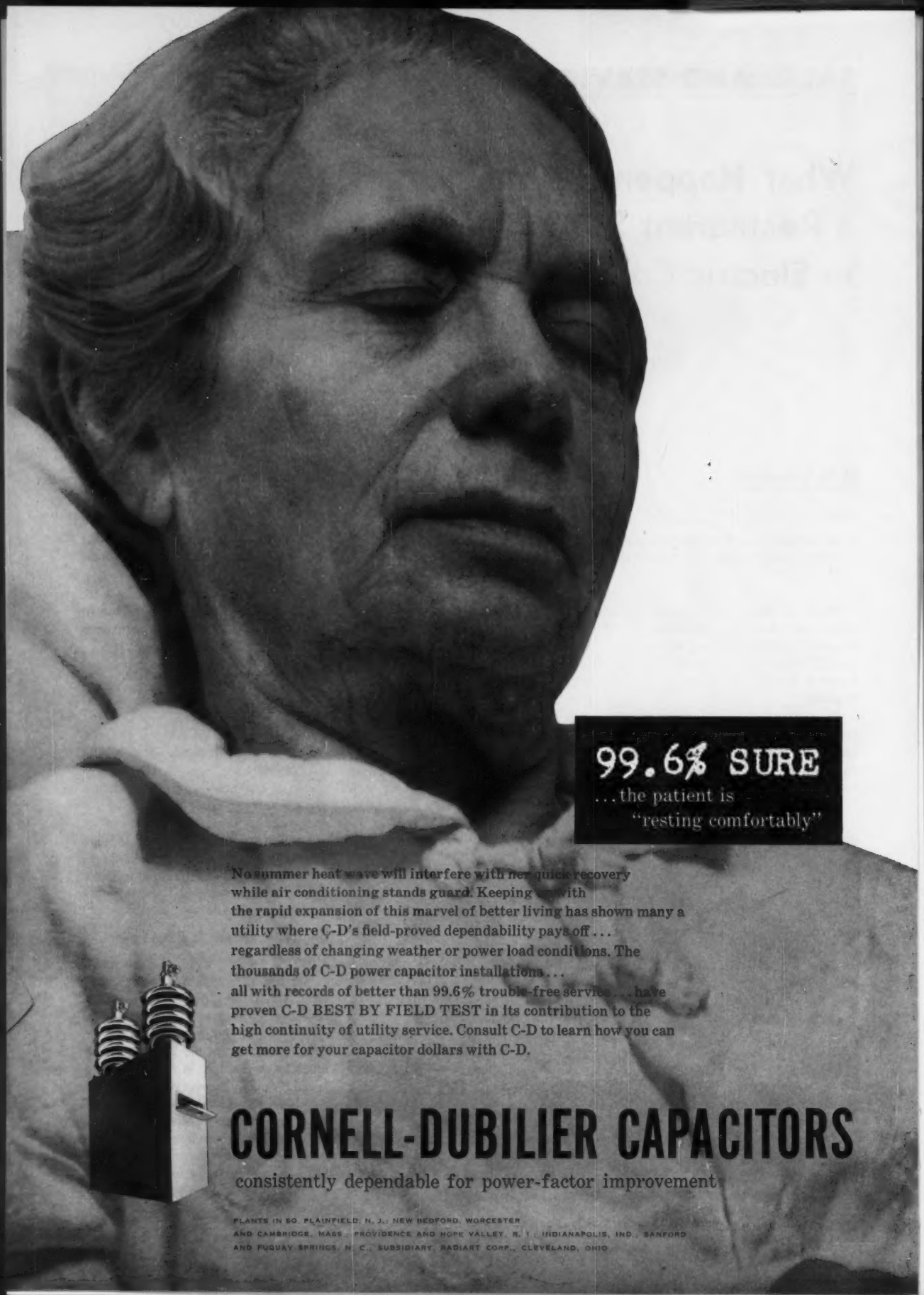
Gains Unexpected Benefits

Evelyn's also is able to realize important indirect savings—savings it never had figured on when it planned the switch to electricity. Before the electric cooking equipment was installed, it had been recommended that the restaurant install 40 tons of air conditioning equipment. But afterwards, it was found that only 17 tons were needed to do the job. Thanks to the coolness of electric cooking, the shore restaurant is able to realize savings totaling thousands of dollars.

Owner Testifies It's Best

Here's what Evelyn Longstreet, owner and manager, has to say about electric cooking: "Far superior to gas in every test in our kitchen . . . We put out more food in less time than we ever dreamed possible . . . and with much less work, too. When it comes to speed, quick recovery, and better tasting meals, electric cooking has my vote. Our customers are well-pleased with the results. The long waiting lines in front of our place indicate that folks are sold on our electric cooking."

(*More S & S on page* 223)


99.6% SURE
...the patient is
"resting comfortably"
No summer heat wave will interfere with her quick recovery
while air conditioning stands guard. Keeping pace with
the rapid expansion of this marvel of better living has shown many a
utility where C-D's field-proved dependability pays off...
regardless of changing weather or power load conditions. The
thousands of C-D power capacitor installations...
all with records of better than 99.6% trouble-free service...have
proven C-D BEST BY FIELD TEST in its contribution to the
high continuity of utility service. Consult C-D to learn how you can
get more for your capacitor dollars with C-D.
CORNELL-DUBILIER CAPACITORS
consistently dependable for power-factor improvement
PLANTS IN SO. PLAINFIELD, N. J., NEW BEDFORD, WORCESTER
AND CAMBRIDGE, MASS., PROVIDENCE AND HOPE VALLEY, R. I., INDIANAPOLIS, IND., SANFORD
AND FUQUAY SPRINGS, N. C., SUBSIDIARY, RADIART CORP., CLEVELAND, OHIO

CORNELL-DUBILIER power-factor capacitors give you better than 99.6% trouble-free service*

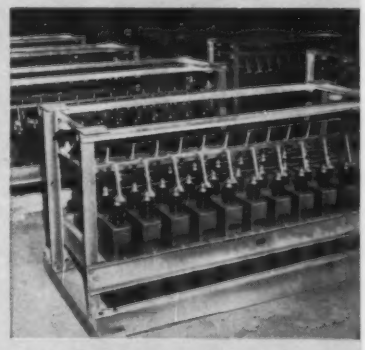
C-D capacitors are impregnated and filled, in hermetically sealed containers with non-inflammable, non-explosive Dykanol. In addition, C-D's conservative engineering and design makes possible the use of special impregnants to fulfill even the most exacting requirements of sub-zero switching operations.

C-D's rack capacitors are shipped completely assembled ready for energization. Again C-D's conservative engineering standards provides the structural strength to do this and as a result save the utility time, assembly and installation costs in the field.

Lowest volts per mil unit stress results in the extra margin of safety necessary to withstand all system high voltage transients. This lower volts per mil and lower volts per section feature is the utility's assurance of extra longevity when C-D's are specified.

Only C-D power capacitors are subjected to a full-rated voltage energization test. C-D removes potential trouble-makers before they get on your poles . . . not after with costly replacements.

Why is it that only C-D power capacitors give you assurance of complete dependability?... because C-D's built-in safety factor results from the ultimate in tried and proven design levels coupled with conservative production techniques and rigorous quality control. For catalog write to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.



C-D 550 KVAR; 2,400V; single-phase, open frame, stacking rack capacitor assemblies.

*This is an average based on reports from leading utilities using C-D capacitors. Many of these reports have shown 100% trouble-free service, and none lower than 98.9%.

Gas Pump Bonanza?

CEI studies filling stations, sees them as a revenue source ripe for development

Gasoline service stations—and their future development—hold high promise as a significant revenue source in the eyes of Cleveland Electric Illuminating Co.

CEI, in fact, has been making detailed studies of service station needs for several years. A report of some of its findings were disclosed at a "Service Station Seminar" it conducted jointly with General Electric Co recently at Nela Park. Some 120 marketing men from 11 major oil companies talked over ways and means of helping service station operators increase their gallonage and enhance ease of service.

CEI people, for example, foresee the day when areas immediately around the pump will be heated by a battery of infra-red lamps. They won't heat the air, but will heat any mass in their range, such as the station attendant's hands, the customer if he gets out of his car, etc. Other innovations:

- Air conditioning of stations so customers will be encouraged to come inside and make additional purchases during hot summer months.
- "Air conditioning" of cars while they're being gassed up by means of a pumping arrangement which pumps cool air into the car from the pump island.
- Hot and cold water fountains so customer can make hot instant coffee as well as get a cold drink of water.

On stations themselves some new ideas for operation on both turnpike and conventional sites were sketched out. One which attracted most attention was a round-house type station, set on the wide center strip of a turnpike road with traffic flowing around the pumps in a circle. A glass and masonry "bubble" in the middle served as a salesroom with the lubritorium and minor repairs building set off to one side of the circle. Another idea, applicable to conventional type roads, was based on installation of turnpike-type stalls, each equipped with a pump for regular and premium grades with overhead traffic lights indicating to motorists which stalls are vacant.

(*More S & S on page* 224)

on new construction

Reliable TENSION SPLICES provide PERMANENT ELECTRICAL CONNECTIONS EASILY

One of three jaws of gripping chuck that HOLDS conductor.

Cutaway of Reliable greased copper Tension Splice with one of the three jaws removed.

FIRST, WHY TENSION IS NECESSARY:

Any mechanical method for splicing electrical conductors requires PRESSURE to provide a first class, low resistance, electrical connection. PRESSURE is not developed unless the connection has been made up *tight*. Generally, tools are used to tighten and put on the pressure.

Tools are *not* used when conductors are joined with a Tension Splice (automatic type). However, even with the Tension Splice, PRESSURE is necessary to make a good, permanent electrical connection. The only tool required to do the job is TENSION.

ON NEW CONSTRUCTION:

Many power companies use this method with complete satisfaction: If sag tensions fall short of 15% of conductor rating, or if sag tables are not used, simply pull up the spliced conductor well above desired sag and then slack off. This practice will invariably take care of those sag tensions that may be too light to develop the pressure that will make a good electrical connection.

Reliable ELECTRIC COMPANY 3145 Carroll Avenue Chicago 12, Ill.

Over 45 years of service to the utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

Electric Heat Kills 50% of Bacteria, Savant Finds

Ordinary ceramic-chimney-type electric heaters kill about 50% of bacteria in the air while they are heating up the bathroom on cold winter mornings, a Stanford bacteriologist has found.

Professor Charles E. Clifton, of Stanford University's Department of Medical Microbiology, tested the heaters at home and in his laboratory. Heaters are a common commercial type.

During the first hour of heating a room in Clifton's house, the air content of bacteria, bacterial spores, and bacterial virus dropped 46 to 56%. In the second hour, it was reduced another 30 to 80%. Tests were made in his bedroom, study, and dining room.

In direct laboratory tests the heaters' germicidal action was even more pronounced, claims Clifton. In these experiments he used atomized bacterial cultures that passed through the heater's chimney in a fine spray. It killed 90% of bacteria, 50-75% of bacterial spores, and 99% of bacterial virus.

The heating unit consists of an open-end ceramic cylinder, about four in. in diameter and 1 ft long, around which the heating element is coiled. It is mounted behind a protective metal grille. Temperatures inside the chimney range from 900 to 1,200F, while the heating element generates 1,100 to 1,500 F.

Competitor's Corner

Thousands of Gas A. C. in '57?

"Several hundred gas motor air conditioning units will be produced in 1956 and several thousand in 1957, and all will be sold through gas companies and LP-gas operators," reports the Coleman Co in "Gas Age" magazine. Coleman explained it wanted to market the units with organizations that had "at least one man experienced and trained to do the best possible installation and service job."

Sees Gas "Fridg" Sales Triple

"Servel's objective is to double gas refrigerator sales in three years and to triple them in six years," declared Richard S. Testut, vice president, Servel, Inc.

Time Is About up—Get Those EEI Entries in

Time is running out for those utilities which still plan to enter Edison Electric Institute's 1955 Prize Awards competition.

The following awards have a Feb. 1 deadline: George A. Hughes Awards, Laura McCall Awards, More Power to America Award, and the George Westinghouse Awards. These award entries are due Feb. 15: Thomas W. Martin Rural Electrification Award, The Better Light Better Sight Bureau Awards, Lighting Promotion Awards, and Frank Watts Awards.

Entries should be sent to Secretary, Awards Committee, Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

S&S SHORTS

Get Finance Plan

Union Electric Co of Missouri this month announced a plan whereby its employees can finance both the purchase and the installation of electric appliances. It also covers modernization of house wiring. The plan allows payments to be made over a 60-month period. Financing charges amount to 1/3 of 1% of the original advance multiplied by the number of monthly installments. Minimum monthly payments may be as low as $4.

Rising Oven

An electric oven which automatically elevates itself at the touch of a switch to the proper working height for the person using it has been introduced by Philco Corp.

Kills Germs, Too

An "electronic germ killer" which it says reduces airborne bacteria to insignificant numbers is feature of '56 air conditioners introduced by Emerson Radio and Phonograph Corp.

Shorties . . .

"Redecoration with Light" will be theme of American Home Lighting Institute, Inc's '56 promotion and advertising. AHLI also plans to sponsor its second annual American Home Lighting Fixture Month in October . . . Deadline for ordering promotional kits for Edison Electric Institute's May-June coordinated electrical gifts campaign is Feb. 4.

on quick repair jobs
Reliable
TENSION SPLICES
provide PERMANENT ELECTRICAL CONNECTIONS FAST
Literally hundreds of teeth in each jaw insure a permanent grip on conductor.
Cutaway shows how floating gripping jaws surround the conductor and HOLD it permanently.

FIRST, WHAT TENSION DOES:

To get a permanent electrical connection it is necessary that the gripping jaws be in tight contact with both the conductor and the tube of the splice.

Momentary tension after the splice is installed achieves this by causing the teeth in the jaws to bite into the conductor and the entire "assembly" to be wedged tightly into the tapered nose of the tube giving solid contact of all parts for a permanent electrical connection.

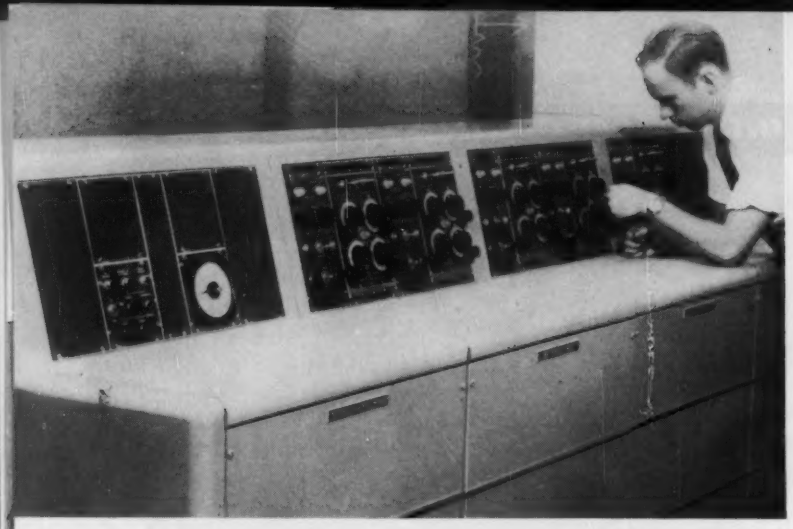
ON QUICK REPAIR JOBS:

When sag tension might otherwise be too light, a quick tug on the spliced span will set the jaws in the conductor and in the tapered tube to make a permanent electrical-mechanical connection.

Reliable ELECTRIC COMPANY 3145 Carroll Avenue Chicago 12, Ill.

Over 45 years of service to the utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES



NEW EQUIPMENT

Automatic Dispatching System

An automatic dispatching system performs routine and repetitive functions of electric utility production departments and regulates power generation to meet fluctuating customer needs.

The new dispatching system consists basically of a remote-position repeating selsyn circuit which requires only a single control channel to each generating station. It adjusts total generation to maintain desired average conditions of frequency and tie-line load.

The system allocates total generation between machines automatically in order to realize a minimum fuel input. This is based on a continuous use of incremental cost data for every machine under control. The system production cost (mills per kwhr) is compared with this incremental cost data for each machine to specify a value of output. Economic features of this control system comprise an analogue computer which continuously specifies an optimum division of output among all machines.

To assure that total generation is properly adjusted to match the area load, measurements of tie-line power and system frequency are combined in order to detect any deviation from desired conditions. Any deviation is employed by the master area controller to correct the prevailing incremental cost signal and restore the power system to balance.

The dispatching system is composed of the four console sections illustrated here:

- The master area section contains all controls for determining the mode of operation for the whole system.
- The dispatching section contains all controls for inserting transmission-loss penalty factors and means for providing signals for the wire line, carrier or microwave channel to each station.
- The master station section has all controls for determining the mode of operation of the station as a whole.
- The turbine control section has all controls for determining the mode of operation of individual turbines and for inserting the complete incremental cost data for the individual turbine and boiler combination.

General Electric Co, Schenectady 5, N. Y.

Power Line Stringer

This machine strings overhead power line conductors under controlled tension. Model 6000-WS takes all conductor sizes through 1.382-in. diam (pheasant) and all sizes and types of standard reels.

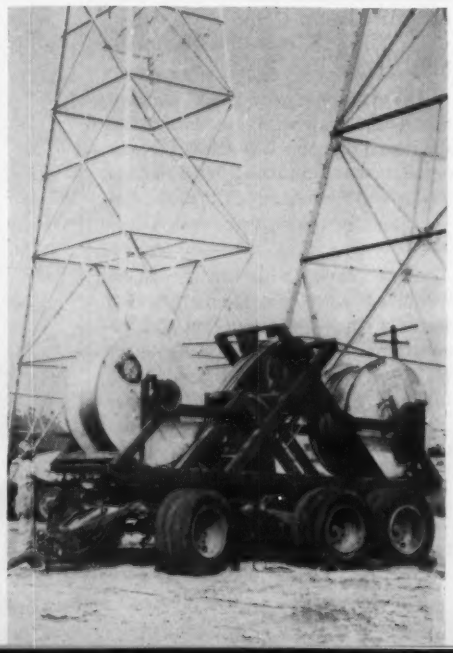
Braking takes place over the double bull wheels that are of cast aluminum alloy and are neoprene lined. One reel tender controls the brakes of one machine holding two reels. Manufacturer reports that, if two units are placed close together, one reel tender can string up to four conductors simultaneously.

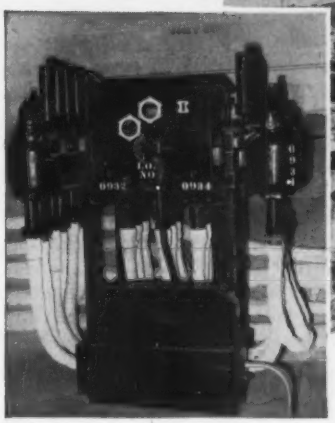
These machines are said to eliminate intermediate guard structures, while guard structures are needed at railroad, highway, and high-line crossings only.

Illustration shows Bechtel Corp stringing 1,033,500-cir mil ACSR for Southern California Edison Co.

Petersen Engineering Co, Santa Clara, Calif.

(*More New Equipment on page* 228)





Switch vault at fabulous Fontainebleau Hotel where durable neoprene-jacketed PILC cables with asbestos fireproofing enter from FP&L conduits. Two sets of 15 kv cables are shown (left). Over 40 miles of neoprene-jacketed cable service Miami Beach.

Florida Power & Light Company reports:

Neoprene jackets solve corrosion problem of lead-sheathed cable at Miami Beach

CORROSIVE ACID GROUND WATER, formed by decaying underground swamps, was the problem faced by FP&L engineers at Miami Beach. A water table only four feet below street level was a further complication. Clearly a rugged, acid-resistant cable was needed for power distribution—and neoprene supplied the answer.

Extensive tests showed that neoprene jackets give lead-sheathed cable long-term protection against corrosion and galvanic attack. And neoprene's resilience and resistance to abrasion convinced FP&L they'd get long service despite vibration and cable movement. Today, *over 40 miles* of lead-sheathed cable jacketed with neoprene carry primary power to Miami Beach!

WHEREVER IT'S INSTALLED—above ground, in ducts or conduits, or buried direct in earth—neoprene-jacketed wire and cable give long, dependable service. Your supplier will give you more information. Neoprene-jacketed cable is available in single- and multiple-conductor types and in voltage ratings to meet your requirements.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

MAIL THIS COUPON TODAY!

FREE! THE NEOPRENE NOTEBOOK. Read how neoprene's resistance to *all* sources of deterioration cuts maintenance costs on products old and new. Actual on-the-job reports are featured in every issue. Clip coupon to get on the mailing list.

E. I. du Pont de Nemours & Co. (Inc.),
Elastomers Division EW-1, Wilmington, Del.

Please put my name on the mailing list for the Neoprene Booklet.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

Smooth "Pulley Action" Wireway Prevents Conductor Chafing
Extra-Sturdy Copper Rivet
Large 1" x 7/8" Hole
Heavy Steel Cup-Base and Yoke—A Single Steel Stamping
Two Holes In Base Assure Effective Drainage
No. 22 x 2-1/4" Screw Assembled Solidly and Rigidly to Metal Base
Extra Sharp Threads and Quick-Starting Point Make Driving Easy

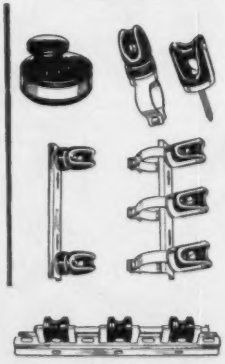
RUGGED DURABLE DEPENDABLE

PORCELAIN PRODUCTS WIREHOLDERS

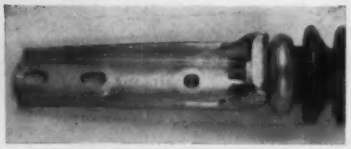
AND SECONDARY SERVICE MATERIALS

Where *quality* and *performance* are necessary for continuous line service—Porcelain Products wireholders and secondary service materials *assure* reliability. They're engineered with strong, sturdy construction—metal in tension, porcelain in compression. Steel parts are hot-dip galvanized . . . screw threads are extra sharp, lubricated for ease of installation. Larger, pulley-action wire hole, for large wire sizes—prevents chafing, wire wear.

These EXTRA features—*plus*—Porcelain Products "Quality Line" reputation, make an unbeatable combination . . . SPECIFY PORCELAIN PRODUCTS wireholders and secondary service materials.



61 Years Porcelain Products, Inc. PP INC.
FINDLAY, OHIO



Pole-Top Bracket

A pole-top bracket is designed for use with 20 and 27-kv post-type distribution insulators and for sub-transmission service with line post insulators up to and including 35 kv.

Manufacturer recommends the bracket for use with post-type insulators in conventional pole-top construction with crossarms, or for an optional method of construction with horizontal mounting of the insulators directly to the pole.

Unit is pressed steel, ribbed for increased strength, and hot-dip galvanized. Two strength ratings are given: 1,500-lb cantilever with posts through 27-kv rating; and 1,000-lb cantilever strength with 35-kv post. Three 11/16-in. holes for mounting allow choice of 5 or 8-in. spacing.

Lapp Insulator Co, Inc, Le Roy, N. Y.

Nut-Running Tool

An air-operated nut-running tool impacts the nut to a desired preset torque, then automatically shuts itself off.

The tool comes in two sizes. Illustrated is Size 5040T which has maximum torque of either 60 or 90 ft-lb. It weighs 6.25 lb, is 10.5 in. long, is rated for 0.375-in. bolts, has working speed of 1,050 rpm, and operates at 2,100 impacts per min.

Size 5340T (not illustrated) is factory preset at 320 ft-lb, but can be adjusted to maximum torque of 550 ft-lb. It weighs 31.5 lb, is 24.25 in. long, is rated for 0.75 and 0.875-in.

(*Continued on page* 230)

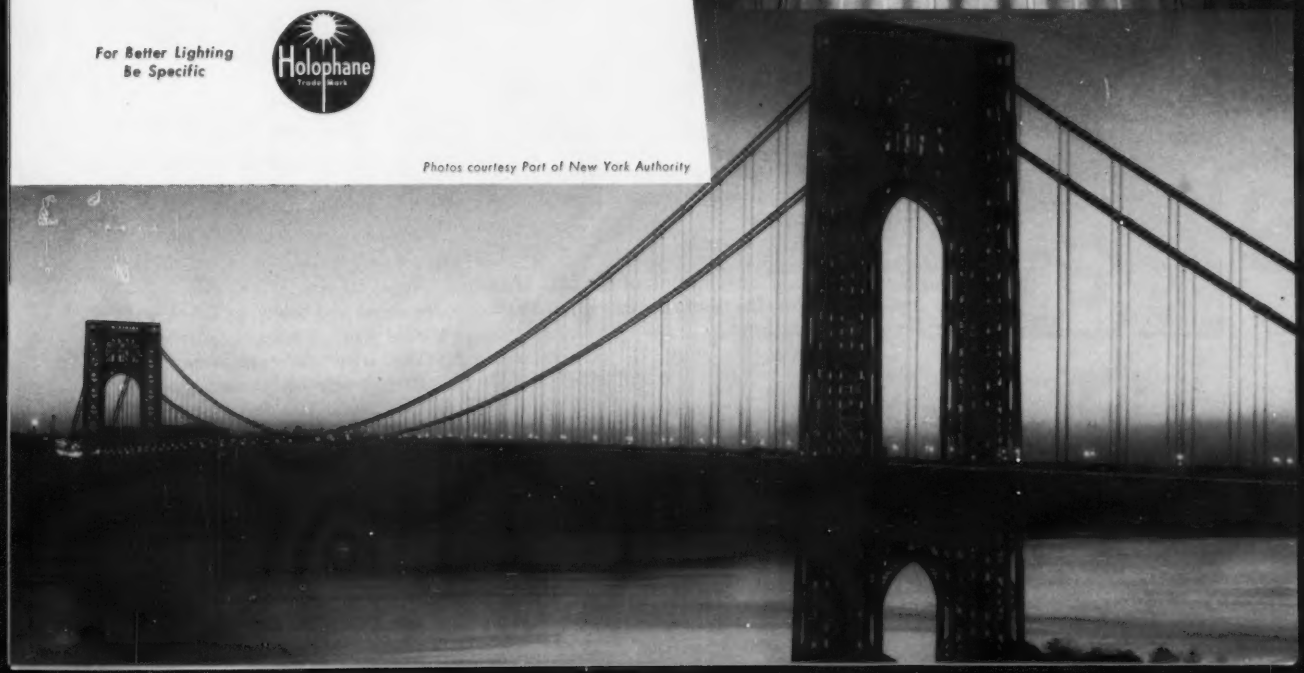
HOLOPHANE REFRACTORS Help to Triple Lighting Efficiency *on the* George Washington Bridge

The Great Light Way over the Hudson is perhaps the most brilliantly illuminated thoroughfare in the New York area . . . The new lighting system for the George Washington Bridge (first major replacement since the span's opening in 1931) includes two hundred mercury-vapor lamps in Holophane Refractors . . . . With their prismatic control the Refractors offer these advantages: (1) maximum concentration of light on the roadway (2) uniform light distribution with brighter pavements (3) greater visibility distance (more illumination per dollar) . . . Another Holophane contribution for better, safer night driving through more effective lighting.

HOLOPHANE COMPANY, INC.
342 Madison Ave., New York 17, N.Y.
THE HOLOPHANE CO., LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

For Better Lighting Be Specific

Holophane Trade Mark



Photos courtesy Port of New York Authority

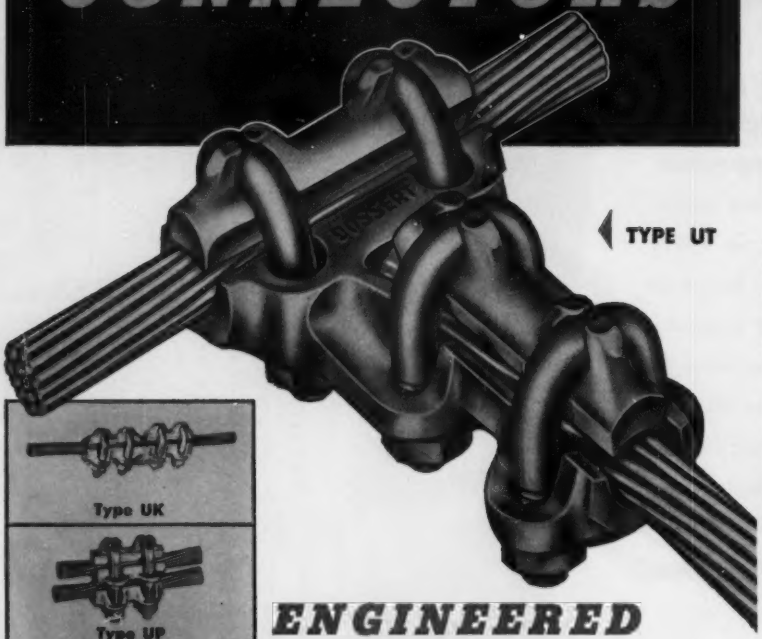
Fast to make fast!

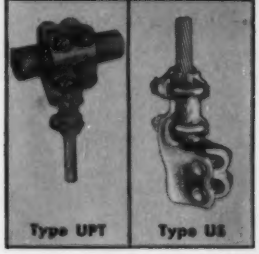
Safe, swift cable connections with

DOSSERT

U-BOLT

CONNECTORS





ENGINEERED FEATURES:

VARIABILITY
Fits many cable sizes, reduces number of connectors needed for given number of combinations of conductors.

HIGH CLAMPING ACTION
U-Bolts clear all conductors by close limits, supported by saddles through their full arcs. Minimizes bending action, makes U-Bolts subject to tensile stress only.

CABLE END RELIEF
Allows for distortion in free ends of strands, ample room for binding end of stranded cable if desired.

CONDUCTIVITY
High copper alloy with sufficient contact area to insure cooler-than-conductor operation under maximum load.

Available for aluminum or aluminum to copper conductors.

50 YEARS OF TECHNICAL KNOW-HOW

WRITE FOR DETAILS AND PRICES TODAY!

DOSSERT MFG. CORP.

249 Huron Street, Brooklyn 22, N. Y.

New Equipment

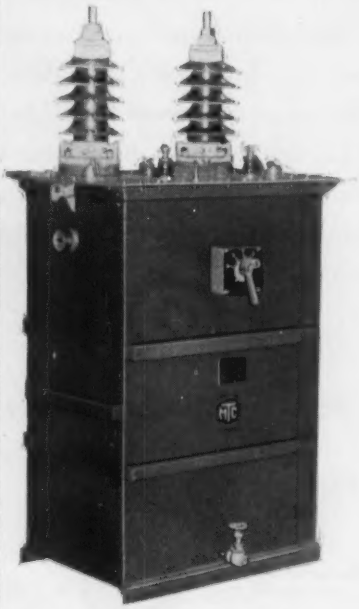
(*Continued from page* 228)

bolts, has working speed of 635 rpm, and operates at 1,270 impacts per min.

The tool, known as the Torque Control Impactool, applies the torsion bar principle to torque control. It eliminates "over-torque" through automatic shut-off, and therefore can be used accurately by inexperienced operators, the manufacturer claims.

Applications include substation and other structural work, equipment maintenance, and general assembly. Additional information is contained in publication Form 5170.

Ingersoll-Rand Co, 11 Broadway, New York 4, N. Y.

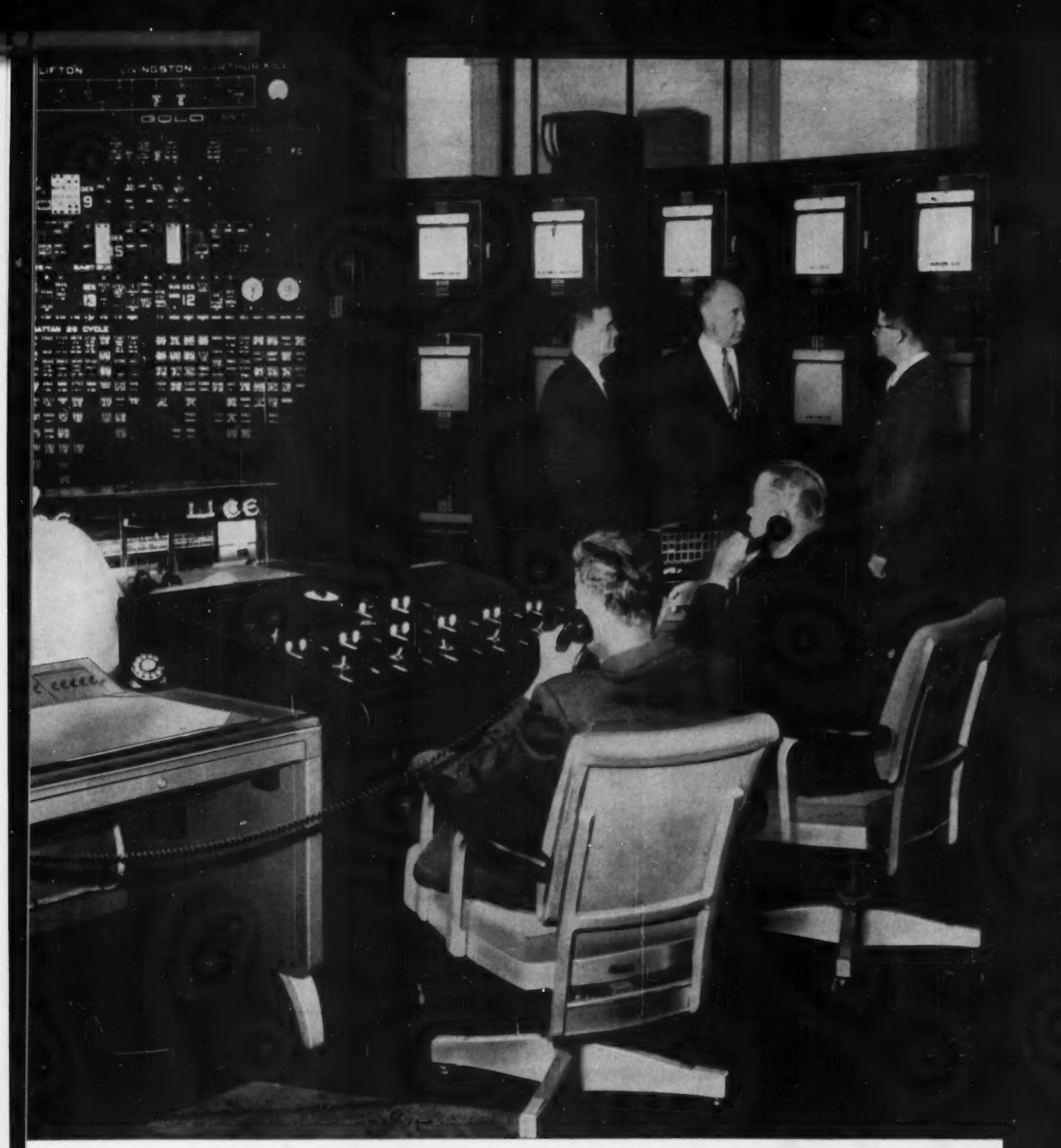


Oil-Filled Transformer

An addition has been made to a line of oil-filled transformers (Type LS). Capacity of these units ranges from 100 to 5,000 kva. The illustrated transformer is 100 kva Class OA, 55C rise, 1 phase, 60 cps, 33 kv, with 2-2½% taps above and below, to 2,400/4,160-Y-v.

This transformer features "pencil-slim" high-voltage bushings, and built-in oil-level and temperature-indicator gauges and tap-changing mechanism. Cross members of the exterior of the case give strength and rigidity. Three

(*Continued on page* 232)



Experience makes the difference . . . in the design and operation of Load-Frequency Control centers such as this New York City Consolidated Edison System Operator's Office. Here, the control must automatically allocate a 1400-MW load pick-up each morning among six of the system's generating plants—and maintain good stack appearance at the same time.

The control was matched to system requirements by Con Edison and a team of Leeds & Northrup Design and Sales Engineers, two of whom are shown with Charles Metcalf, Con Edison Engineer (standing, second from right).

For a reprint of an AIEE paper describing the design and operation of this installation, contact L&N men in any of 18 District Offices, or at 4904 Stenton Ave., Phila. 44, Pa.—"their experience makes the difference."

LEEDS NORTHRUP

300 Load-Frequency Control Installations 1927-55

Does your plant use switchgear?

Here are two C&D batteries designed for

switchgear control auxiliary power

C&D's *two* modern batteries—are specifically designed for control, switch gear, and auxiliary power applications. The two batteries, PlastiCal and PlastiCell, are available in practically any capacity—from 10 A.H. to 770 A.H.

PlastiCal has lead-calcium grids for maximum life—conservatively engineered for 25 years in full-float service.

PlastiCell has heavy positive plates of high-tensile alloy grid metal for extra life and a projected life of 14 years in full-float service. With PlastiCal and PlastiCell you get:

1. Extra-long life. Exclusive design combines advantages of both suspended and supported plate construction.

2. Triple insulation—thick Fibreglas mat, microporous separators, and perforated Koroseal retainer.

3. Saftee Vent—outstanding C&D development that prevents accidental battery explosions.

4. Crystal-clear plastic jars—heat-resistant and hermetically sealed.

5. Plastite Post Seals—easier maintenance.

For Details—

Write for new C&D Specification Bulletins: CP-536 on PlastiCal Batteries and CP-537 on PlastiCell Batteries

C&D BATTERIES, INC.

of Conshohocken, Pa.

Manufacturers of Industrial Batteries since 1906

Sales and Service Offices in Principal Cities from Coast to Coast

New Equipment

(*Continued from page* 230)

special coats of paint, applied over a shot-blasted surface, furnish protection against weather and corrosion.

Lifting lugs and other AIEE and NEMA accessories are included as standard equipment.

Marcus Transformer Co, P. O. Box 551, Rahway, N. J.

Auger Teeth

A reversible tooth in two sizes is designed for use on earth-boring augers and cutting heads.

The No. 49 Pengo tooth is designed for augers powered by heavy and extra-heavy duty boring machines. The No. 41 Pengo tooth is for use on medium and light-weight machines.

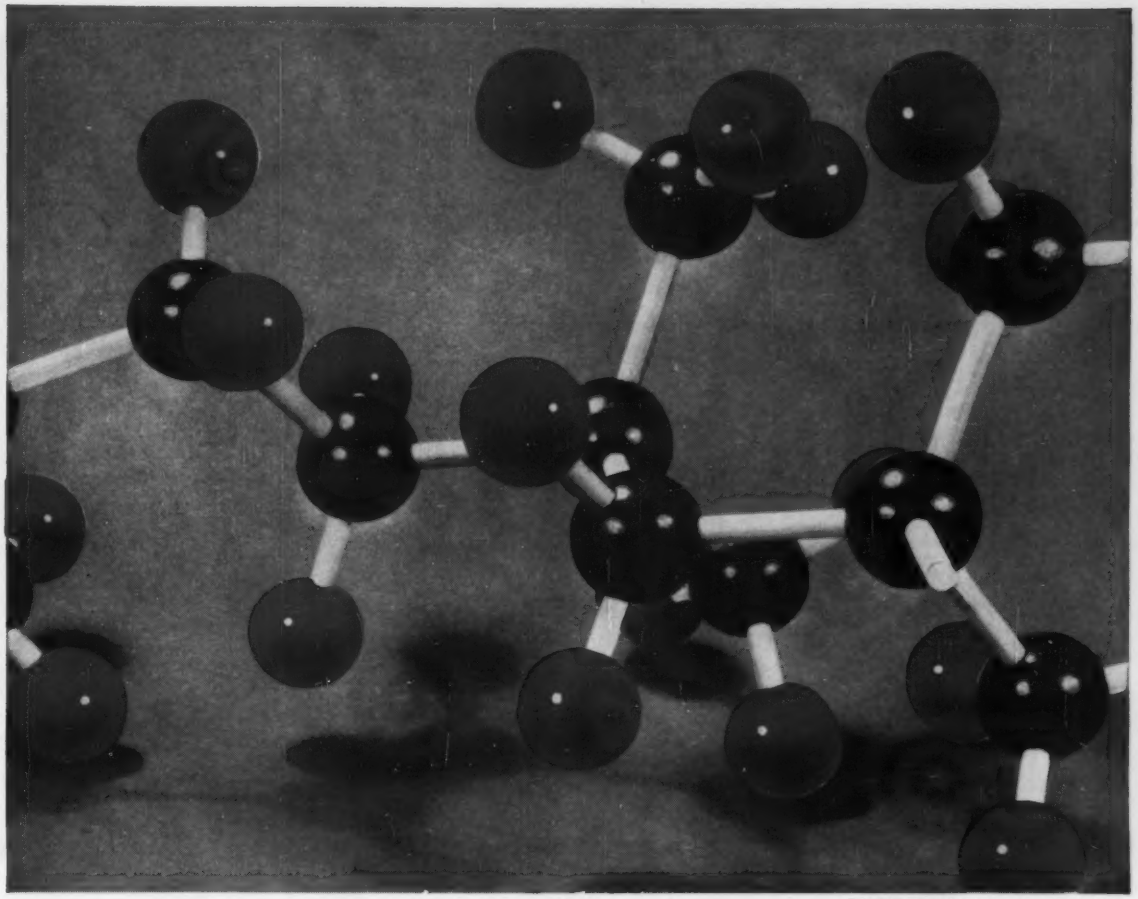
Features include long-wearing surface and reversibility. The manufacturer reports that the boring angle permits boring in most instances without any down pressure. This is said to eliminate wear on clutch plates and to conserve power.

Petersen Engineering Co, Santa Clara, Calif.

Epoxy Compound

A hard-setting plastic compound, known as Thoxene Clamp-Coat, was developed to permit rapid field insulation and weatherproofing of electrical cable splices. Packaged in a compartmentalized polyethylene container, the compound is ready to use

(*Continued on page* 236)



PORTION OF ENJAY BUTYL MOLECULE

Enjay Butyl—*greatest rubber value for electrical application*

Enjay Butyl, an amazingly versatile rubber, has opened a whole new field of electrical application. It has proven itself ideal in such varied uses as high voltage cable insulation, casing and insulation for indoor-outdoor transformers, and insulation for underground service cables. The reasons: its long life, low power factor and dielectric properties, stability to temperature change and resistance to heat and aging combined with its outstanding resistance to ozone and corona, superior low-temperature flexibility, and resistance to moisture absorption and abrasion.

● Check these three *outstanding* features of Enjay Butyl: *excellent electrical properties*, a *definite price advantage*, and *immediate availability*.

● Enjay Butyl may have a place in *your* operation. It can cut costs, increase the performance of your product. It will pay you to get all the information on this low-cost rubber. The complete laboratory facilities and skilled technical assistants of the Enjay Company are at your service. Contact them today.

ENJAY BUTYL

Enjay Butyl is the super-durable rubber with outstanding resistance to aging • abrasion tear • chipping • cracking ozone and corona • chemicals gases • heat • cold • sunlight moisture.

ENJAY **ENJAY COMPANY INC., 15 West 51st Street, New York 19, N. Y.**
District Office: 11 South Portage Path, Akron 3, Ohio.

36 SUCCESSFUL YEARS OF LEADERSHIP IN SERVING INDUSTRY

How Rome Synthinol® Control Cables serve Philadelphia Electric at its New Cromby Station

Philadelphia Electric Company, privately owned and an important producer of electrical power, has recently completed its eighth large generating station—Cromby.

The Cromby Station will increase the capacity of Philadelphia Electric's system by 17% to keep pace with booming industrial and residential development of the Delaware Valley.

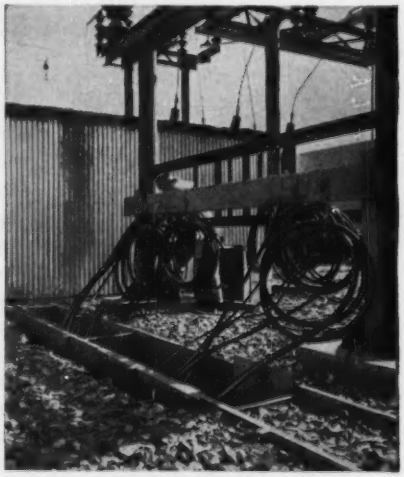
Cromby is a two-unit station. Already in operation is a 150 megawatt steam generator and an additional 200 megawatt unit will be operating by mid-1956.

Over 1,500,000 conductor feet of Rome Synthinol Control Cables were used at Cromby. There are two major applications . . . remote control of high-voltage yard circuits and regulation of the soot blowers. Underground cables for yard control are insulated with Rome Synthinol, rated at 60°C.

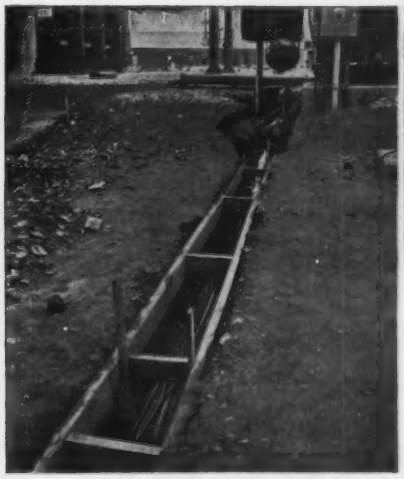
You, too, can specify Rome Synthinol Control Cables with confidence.

The Cromby story is continued in the picture captions . . .

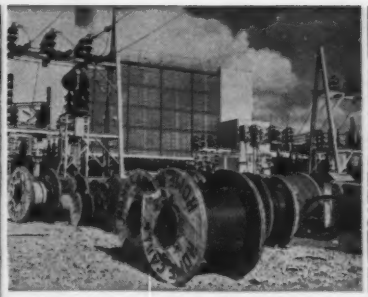
The development of cables, having multiple conductors under a common nonmetallic sheath, in which Rome has played an important role, has been of inestimable value in station control planning. Not only do they save installation time and costs but provide good mechanical protection, as well.



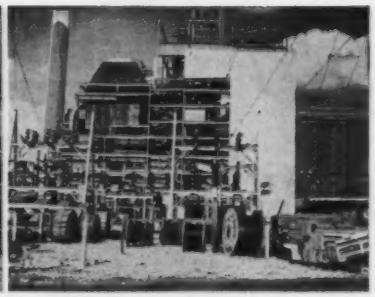
The fundamental application of Rome's product is in control of the 33,000, 66,000 and 132,000 volt yards. There the Rome Synthinol (polyvinyl chloride) insulated and sheathed cable is buried directly in earth.



Every factor was weighed carefully before specifying polyvinyl chloride for underground work. Its qualifications fitted two very important requirements at Cromby . . . high resistance to moisture and good dielectric strength.



The Rome underground cable at Cromby is expected to last a good many years. Its superior resistance to soil conditions assures long, trouble-free service life.



Installation experience under a wide variety of service conditions has proved polyvinyl chloride insulation and sheath to be extremely dependable—more economical than some other constructions.

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

CONTINUOUS, TIGHT, ALL-AROUND GRIP FROM END TO END

the overhead conductor + fine FANNER superformed ARMOR RODS

UNIFORM FULL-LENGTH GRIP

Fanner Superformed armor rods contact conductor permanently and tightly *at every point* — not just at clamps.

COMPLETELY EFFECTIVE ARMORING

Exclusive, precision formed construction provides rugged, lasting protection for conductor.

DEPENDABLE PERFORMANCE

Every installation fits perfectly into place. Fanner precision design eliminates special skill on part of lineman.

RE-USABILITY

When reconductoring or line relocation demands it, Fanner Superformed Rods may be reapplied without rod waste or loss of armoring.

LOW INSTALLED COST

Fine Fanner Superformed Rods provide both initial and long term economy through low cost, easy application and multiple capabilities.

Licensed for use under Patent No. 2,275,019

THE FANNER MANUFACTURING CO.
Brookside Park • Established 1894 • Cleveland 9, Ohio

AGENTS IN PRINCIPAL CITIES

ARMOR RODS • TAP ARMOR • LINEGUARDS • PATCH RODS

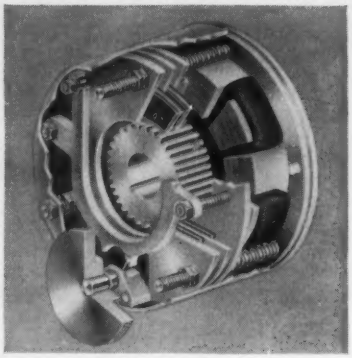
New Equipment

(*Continued from page* 232)

as soon as its two separate components are thoroughly mixed. Setting time is from 2½ to 3 hr.

Properties of the compound include: Dielectric strength—450 vpm; volume resistivity—4.2 x 10^{19} ohm-cm; surface resistivity—1.3 x 10^{18} ohm; dielectric constant (1 kc)—5.0; dissipation factor (1 kc)—0.059; water absorption (24 hr)—0.51%; elongation—48%; Shore D hardness—58; tensile strength—900 psi; impact strength (80F)—55 ft-lb.

Shell Chemical Corp, 380 Madison Ave, New York 17, N. Y.



Electric Brake

This electric brake features a magnet with a circumferentially wound core and armature which is said to reduce power losses by 80%.

The brake (Series E) may be connected to either two or three-phase motors. It is also reported to have high pull-in force at large air gaps. The manual release is located off-center to permit two-end shaft mounting.

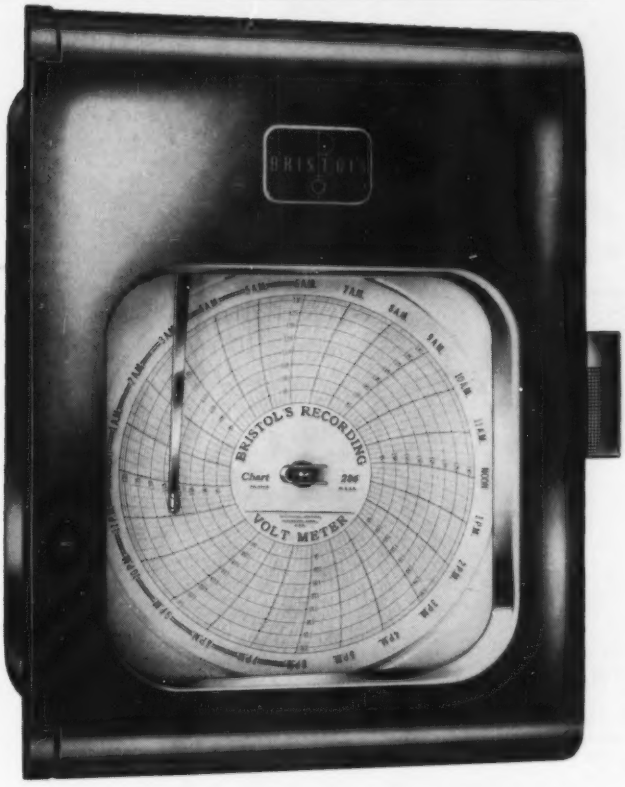
Miehle Printing Press & Mfg Co, Star-Kimble Motor Division, Bloomfield, N. J.

Glass Micro-Fiber Paper

A glass micro-fiber paper can be impregnated with silicones, electrical varnishes and resins. Uses include slot cell liners, slot armor, glass base sheet laminates, tapes, transformer layer insulation, and in mica and glass paper combinations.

(*Continued on page* 241)

WHAT'S NEWS AT BRISTOL . . .



PERMANENTLY MOUNTED Bristol Voltmeters and Ammeters come in three models: interchangeable surface and flush, surface-panel, and flush panel.

How do you pick the right recording ammeter or voltmeter?

The *right* choice for any voltage or current measurement and recording job is a Bristol Series 500 instrument.

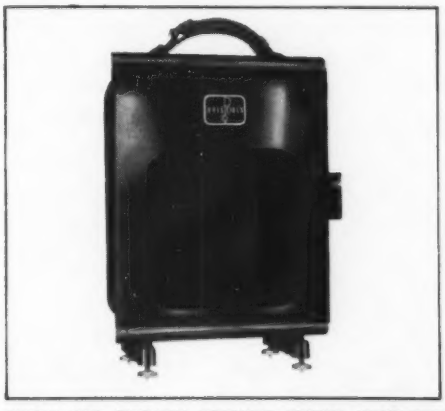
Why Bristol? Mainly because for sheer accuracy the Bristol Recorders can't be topped. Among the reasons for that are:

1. Low burden – the lowest burden of any round-chart recorder on the market.
2. Extremely high torque gradient.
3. Temperature compensated.
4. Shock-proof moving element mounting.
5. Leveling of instrument not critical.
6. Continuously legible recording of sudden changes – up to full scale value.

Also, Bristol's Series 500 Voltmeters and Ammeters are designed for easy use, with dust- and moisture-proof cases; quick-set chart hub for each chart changing; and snap-on chart plate.

Models offered that comply with ASA Specification C39.2.

Want more facts? Write for Bulletin E1111 to the Bristol Company, 116 Bristol Road, Waterbury 20, Conn. 5.19



SINGLE AND TWO-PEN PORTABLE BRISTOL RECORDERS are offered in two models: one chiefly for portable pole mounting and the other for general portable service.

NEW BALL-BEARING SUSPENSION, loaded by a coil spring, prevents damage even under severe mechanical shock. Corrosion-resistant stainless steel ball bearings are almost tool-hard.

BRISTOL

TRADE MARK BRISTOL'S REG U.S. PAT. OFFICE

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Need Alum Cable

Long before many wire and cable users ever considered aluminum, the white metal became an active part of Anaconda's plans for the future. As a result, Anaconda is the only manufacturer in the industry today who is prime producer and fabricator of *both copper and aluminum.*

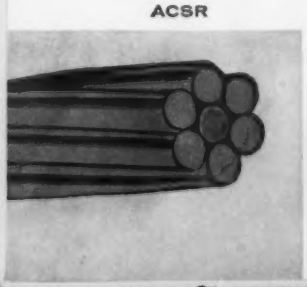
Now, when you may be thinking seriously of aluminum for the first time, or of increasing your percentage of aluminum purchases – Anaconda offers you this:

1. *Broadest line of aluminum conductors in the industry* including bare aluminum and ACSR; Neoline*, Polene* and Duraline* line wire; Types SE, SD, N-SD and K service cables; aerial power cable; network cable; cathodic protection cable; and many others.

2. *Seven-mill service.* Anaconda has more mills producing aluminum wire and cable than any other manufacturer. Seven fabricating mills strategically located across the country assure speedy service.

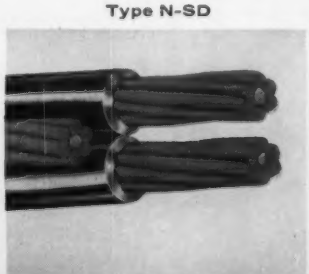
3. *Electrical Distributors.* Anaconda Wire & Cable Company has several hundred electrical distributors located throughout the country who can expeditiously provide you with Anaconda products.

ACSR

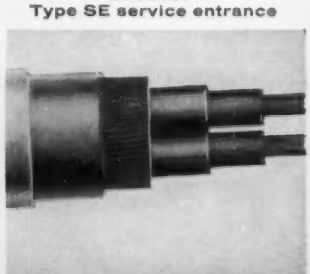


Bare strand aluminum

Type N-SD



Silvaline*
Type SE service entrance



more inum ?

ANACONDA IS READY WITH THE BROADEST LINE IN THE INDUSTRY

4. *Reduction plant* at Columbia Falls, Montana, gives Anaconda control over its aluminum production from reduction of alumina . . . to wirebar . . . to rod . . . to finished product.

5. *Insulated-cable experience* – in design, research, construction and quality control – helps Anaconda produce aluminum wire and cable with superior electrical and physical characteristics.

6. *Technical assistance.* Anaconda field engineers have worked in advisory capacity on hundreds of complex jobs. They are ready to put their experience and knowledge to work on your problem.

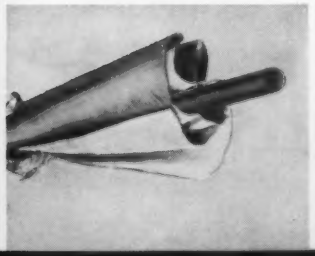
The Man from Anaconda will be happy to help you. Backed by the broadest line of wire and cable in the industry in both copper and aluminum, he is best qualified to help you arrive at the most practical and economical answer to your cable needs. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U. S. Pat. Off. 56301

ASK THE MAN FROM ANACONDA®

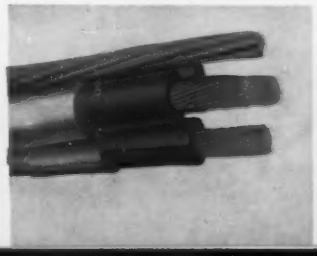
FOR ALUMINUM WIRE & CABLE

Duraline*



Neoline* and polyethylene line wire

Aerial cable



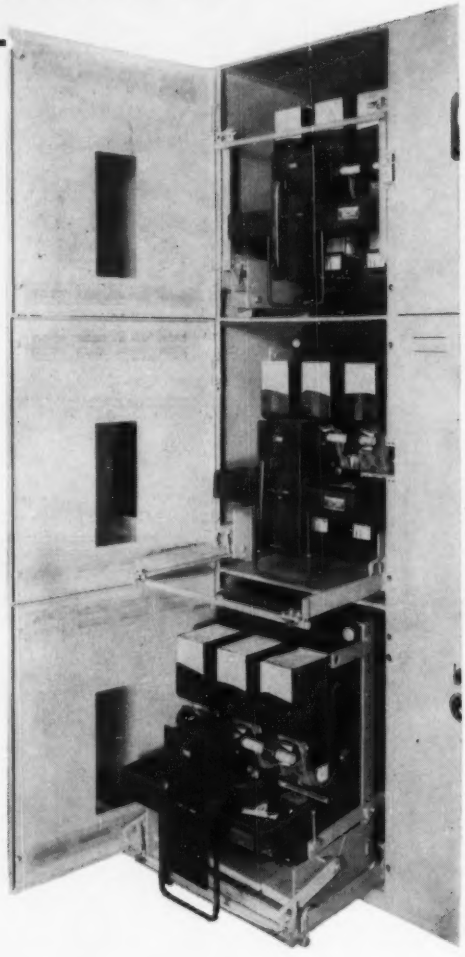
Type CP cathodic protection cable

Outstanding Simplicity of Design in Drawout Switchgear! NOW Built to Your Exact Specifications!

This development in 600-volt drawout switchgear is important to you for these three reasons:

- It is a definite improvement on conventional design — simpler, cleaner, more quickly and easily operated, fully positive, with adequate expansion factor for future needs.
- It is the product of a highly competent engineering staff, well aware thru long experience of the requirements and responsibilities of working with utilities.
- It is our design concept adapted to your needs and exact specifications to save your money and engineering time. Design, detail, and fully satisfactory operation have been proven by extended service in the field.

For more information on this complete engineering service for utilities, please write today. Your interest is appreciated, and your inquiry will receive prompt attention.



OPERATING CHARACTERISTICS

Single arm motion moves breaker to or from test position — no pumping, cranking, or similar operation anywhere in the cycle.

Nothing removable to get lost, no accessory or loose equipment required. Each unit is entirely self-contained.

Maximum accessibility for maintenance or adjustment. Carriage is open at top, bottom, and sides.

Lifting lugs near center of gravity minimizes rocking in lifting, facilitates hoist pick-up, fully forward of switch board in withdrawn position.

Each unit fully interlocked to prevent moving closed circuit breaker to or from operating position. Interlocks to meet your specifications.

Other engineered products include:

HIGH VOLTAGE SWITCHGEAR BUS RUNS CONTROL & PROTECTION FOR GENERATORS & SUBSTATIONS SPECIFICATION EQUIPMENT INDUSTRIAL CONTROLS METAL PRODUCTS SPECIAL EQUIPMENT

THE WOLFE & MANN MFG. CO.
BALTIMORE 11, MARYLAND

W/M

New Equipment

(*Continued from page* 236)

Manufacturer claims the paper combines mechanical strength with high absorbency. The fibers are said to be highly inert, 100% inorganic, and to have no metallic impurities.

Paper made of the fibers is a uniform thickness of 1 mil, and other thicknesses are available. It is made in roll form, either sized or unsized, and is said to meet all requirements for Class H insulation.

LOF Glass Fibers Co, 1810 Madison Ave, Toledo 1, Ohio.

50-Kvar Capacitor

This 50-kvar power capacitor, introduced as a trial model last September, has had its dimensions altered to fit racks designed for 25-kvar units.

The 50-kvar model has the same base dimensions as the 25-kvar unit, but is 11 in. taller, 32 in. to top of bushings. It weighs about 110 lb, compared with 68 lb for the 25-kvar unit.

The new capacitors are now available in 5 and 8.7-kv classes.

General Electric Co, Schenectady 5, N. Y.

(*More New Equipment on page* 242)

USE DIAMOND UtiliVue
INDUSTRIAL TELEVISION SYSTEM

Everyone can see those tall chimneys that carry off gases or fumes from your plant. Many of these people will judge unfairly . . . will blame you for everything from smog to tattle-tale grey wash . . . even though there is smoke for only a few minutes a day.

The "UtiliVue" (wired television) will bring a sharp picture of the stacks to the control panel or any other convenient point. The operator SEES the smoke exactly as do people on the outside and takes corrective action at once. Chimney smoke is only one of many things that the "UtiliVue" can watch to your profit and advantage . . . in fact, anything that is too remote, too hot, or too dangerous to observe directly. Get in touch with your Graybar Distributor or use the coupon below for informative booklet.

UtiliVue Camera

Monitor

7119

Distributed by GraybaR ELECTRIC COMPANY

DIAMOND POWER SPECIALTY CORP.
FIRST IN INDUSTRIAL TELEVISION
LANCASTER, OHIO
OFFICES IN 39 PRINCIPAL CITIES
Diamond Specialty Limited — Windsor, Ontario
Since 1903, Diamond has Manufactured Quality Equipment for Industry

DIAMOND POWER SPECIALTY CORP.
ELECTRONICS DEPT., P.O. BOX 56C
LANCASTER, OHIO

Please send me without obligation a copy of new bulletin showing how Diamond Industrial (Wired) Television will help me reduce costs, improve quality, increase sales and aid safety.

Name_____
Title_____
Company_____
Address_____

Why Pay 3 MEN to Watch Your Line Crew Work?

START SAVING TIME and MONEY with

TEL-E-LECT 2-MAN UTILITY RIGS

If you're using 5-man crews and old fashioned utility equipment (even on '55 chassis) you've got *three extra men on most jobs!*

With Tel-E-Lect equipped trucks you'll discover the great time and money saving advantages of 2-man construction trucks. Leading public utility companies throughout the country are now using 2-man trucks to do a large share of the work once performed by 5-man crews—and they're realizing increased profits in the process.

Your 2-man crew won't work any harder, but they'll produce more and do it faster than many 5-man crews. You see, Tel-E-Lect builds the services of three men into its utility truck equipment. Tel-E-Lect equipment provides new power features that require only two men to perform the tasks once done by five!

The 2-man construction equipment described here lets you put smaller crews on everyday jobs while freeing big crews and big equipment for the really tough highline jobs.

THE TEL-E-LECT COMBINATION BODY

This *complete* package consists of a rugged steel body, stowaway derrick, winch and drive, pole hole digger and drive and rapid forward-reverse transmission. Three simple installation steps by your local mechanic puts the Combination Body on your truck chassis regardless of make or model. You simply install power take-off . . . mount body and connect power drive . . . and install cab controls. It's now ready to go to work!

A Tel-E-Lect all steel Combination Body is completely equipped with Stowaway derrick, digger and power units—a model 2-man construction truck.

Front mounted Tel-E-Lect "T" frame derrick and Tel-E-Lect Pole Hole Digger gives this utility truck 2-man versatility.

WINCH, DIGGER AND DRIVE KITS FOR ALL POPULAR-MAKE TRUCKS

A series of easily installed Tel-E-Lect kits make it possible to install derricks, diggers and power drives at the front of your present utility truck. The flexibility and economy of 2-man operation can be extended to any size or model of International 4x4, Ford, Chevrolet, GMC, Dodge or other truck.

These Tel-E-Lect kits are designed specifically for the particular truck on which they will be installed. Each kit contains every part needed for easy installation by your local mechanic.

TEL-E-LECT SELF-STORING DERRICK CONVERSION KITS

An entirely new concept of derrick storage eliminates the hazards once involved in derrick erection and take-down. Your front mounted "A" or "T" frame derrick stores on top of the truck—doesn't use valuable body space for storage.

Your truck's winch supplies power to raise or lower derrick. With a double drum winch you'll get "live-boom" flexibility and with a single drum winch you'll get easily adjustable derrick elevation! This low cost unit fits any truck with or without body and is quickly installed.

This 2-man construction truck features a front mounted Tel-E-Lect T-45 derrick and Tel-E-Lect Self Storing Derrick Conversion. The derrick is shown in its stored position in the smaller photo.

Tel-E-Lect provides other kits for individual requirements. Write us about any of your utility truck problems.

TEL-E-LECT PRODUCTS, INC.

TEL-E-LECT PRODUCTS, INC.

10,003 Minnetonka Blvd., Minneapolis 16, Minnesota

Test Sets

Two pieces of portable equipment are designed for testing work on street lighting systems.

Model C-109 relay test set (illustrated) provides the means for testing all dc polatrol relays used in street lighting systems.

Model C-110 voltage quadruple test set (not illustrated) provides high voltage for series circuits from pole to pole.

Both units are portable and weather proof. The manufacturer reports that they have been field tested for over a year by a northeastern electric utility.

El Mec Laboratories, Inc, 730 Boulevard, Kenilworth, N. J.

Welders

SRH Series dc rectifier type welder is a horizontal unit with weatherproof case. It has a single current range and is available in three models with 60% duty cycle ratings of 200, 300 and 400 amp.

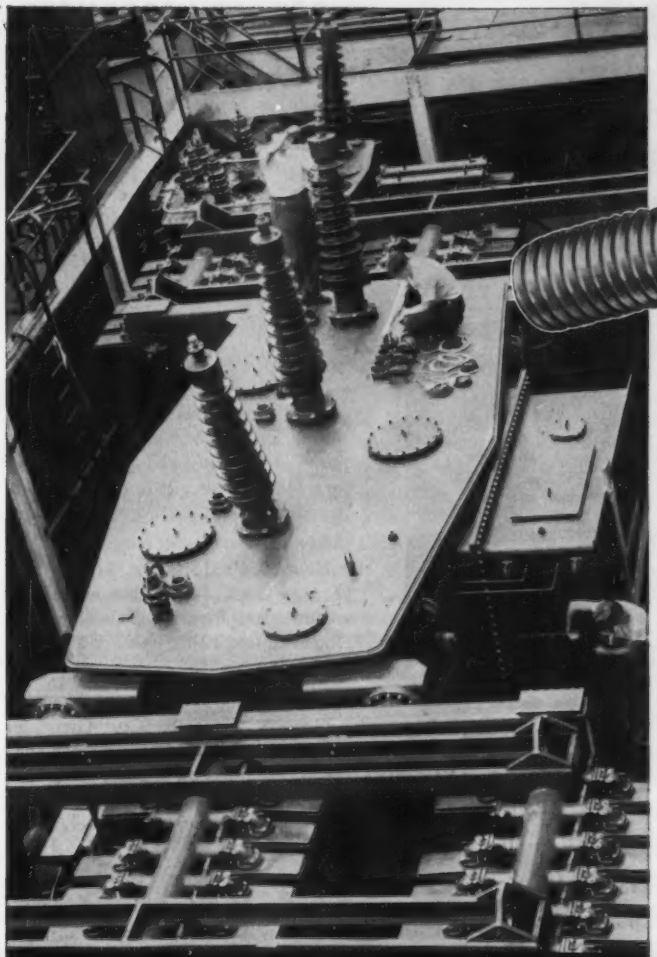
SRAC Series is designed for metallic arc welding and is available in 200, 300 and 400-amp ratings, with or without power factor correction.

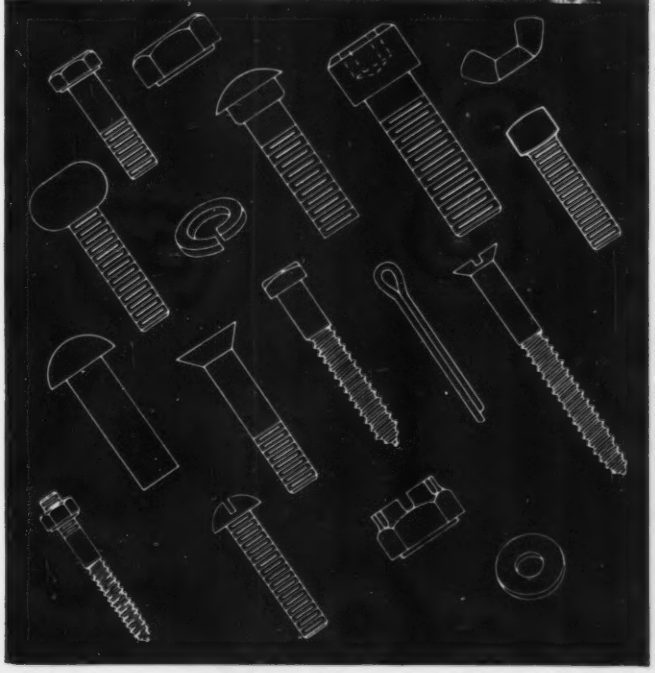
SRTA Series is designed primarily for inert gas and inert gas spot-welding processes. It is available in 200 or 300-amp models, all with power factor corrected.

SRAC and SRTA ac/dc welders operate from a single-phase circuit, and current can be controlled remotely at the welding position.

Miller Electric Mfg Co, Inc, Appleton, Wis.

(*More New Products on page* 244)





½—13 x 3
Oval Neck
Silicon Bronze
Connector Bolt

STOP CORROSION

Enemy of Utilities!

Ugly, wasteful corrosion . . . shortening the life of utility equipment . . . adding to maintenance costs.

Prevent this Public Utility Enemy from gaining a foothold. Everlasting Fastenings by Harper solve corrosion problems—protect costly electrical equipment—give years of on-the-job service.

Harper corrosion-resistant fastenings are produced by the largest specialist in fastenings of non-ferrous metals and all stainless steels. Over 7,000 different stock items quickly available.

For specialized fastenings, Harper engineers and metallurgists are ready to serve you—backed by knowledge gained through 30 years' experience. Call on Harper—Branches and Distributors in all major market areas, or write for the new Harper catalog.

THE H. M. HARPER COMPANY
8205 Lehigh Avenue
Morton Grove, Illinois

BOLTS • NUTS • SCREWS • WASHERS
RIVETS • COTTER PINS • SPECIALS

SILICON BRONZE • COPPER • ALUMINUM
NAVAL BRONZE • BRASS
MONEL • NICKEL
ALL STAINLESS STEELS

HARPER
EVERLASTING FASTENINGS

SPECIALISTS IN ALL
CORROSION-RESISTANT FASTENINGS

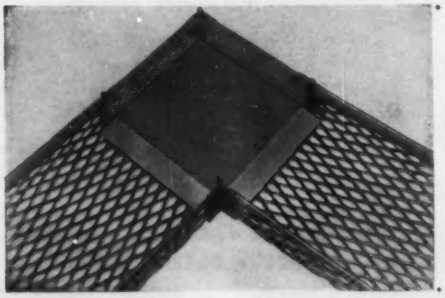
P.G.&E. Uses Cope Cable Trough

Humboldt Bay Steam Plant Pacific Gas & Electric Corporation
Engineers: Bechtel Corporation

Pacific Gas and Electric installed Cope cable trough for its latest installations in new generating stations. Efficient utilities everywhere are adopting Cope cable trough to eliminate costly and needless conduit.

Cope cable trough saves three ways:

- *Materials* are reduced by 75% on a lineal foot basis
- *Installation costs* are reduced because cable trough is so easy to install
- *Operating costs* are reduced because accessible cable is simple to inspect, repair or replace and additions are simply laid in existing trough.



New Cope 70,000 Series features unique flexibility in elbows—reduces the need for standard fittings.

Our engineers are ready to work with you. Write us today for full details on new 70,000 Series.

T. J. COPE, INC.

711 SOUTH FIFTIETH STREET, PHILADELPHIA 43, PENNA.

Cope

GROUND TENTS

ROD GRAPPLES

CABLE REEL JACKS

WARNING SIGNS

CROSS ARM SHEAVES

MORE NEW PRODUCTS

Buchanan Electrical Products Corp, Hillside, N. J., has **terminal strips** with post-type barriers and studs for attachment of single or multiple terminal ended or looped wires.

General Electric Co, Plainville, Conn., offers 100-amp **service entrance panel** with 5 fuse pullers and 8 plug fuse branch circuits. It is rated for 120/240-v ac, single-phase, 3-wire service and has 100-amp main lugs.

Metron Instrument Co, 432 Lincoln St, Denver 3, Colo., has a **tachometer** (Series 42X) with overspeed and underspeed controls. It is available with any of 48 scales.

Neo-Ray Products, Inc, 315 E. 22nd St, New York, N. Y., has a recessed **incandescent fixture.** Details on the hinged square 12-in. unit are available in Catalog No. 545.

General Controls Co, Glendale, Calif., offers a **24-v transformer** that can be mounted on a 2 x 4-in. handibox. It provides an additional power outlet with a line-voltage receptacle.

Wilbur & Williams Co, 130 Lincoln St, Boston 35, Mass., has a **zinc coating** that is 95% pure zinc and dries in 30 min. Applicable by brush, spray or dip, it withstands heats to 400F and is resistant to weather and salt spray. The coating is known as Zinc Shield.

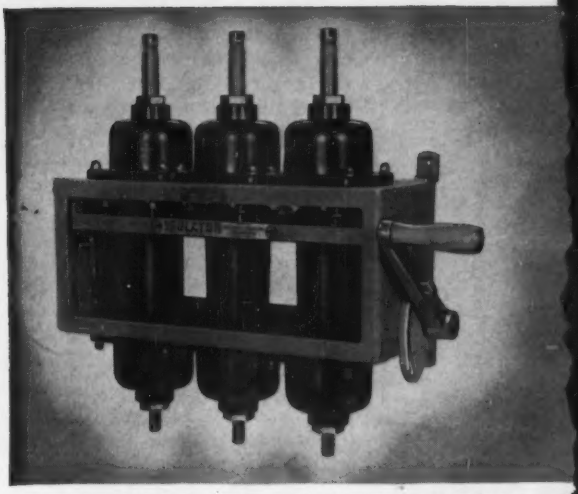
Thompson Products Inc, Dage Television Division, Michigan City, Ind., has a remote control **closed-circuit television system** (285-A Servo System). It includes a multi-lens camera and a separate monitor-console.

Edwin L. Wiegand Co, 7500 Thomas Blvd, Pittsburgh 8, Pa., has added flexible rust-proof brass conduit covering to lead wires of Chromalox **electric cartridge heaters** for moisture and vapor protection.

Industrial Products Co, 2808 N. 4th St, Philadelphia 33, Pa., has a one-piece **protective suit** made of close-woven cotton coated with neoprene on both sides.

(*Continued on page* 246)

ISOLATORS need only 1/3 the usual space for transformer disconnects



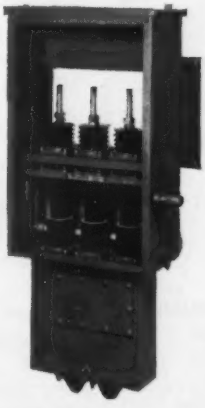
Three pole single throw 400 ampere 5 kilovolt Air Interrupter ISOLATOR.

The "Three E" Air Interrupter ISOLATOR is ideal for breaking magnetizing current of power transformers. Current is interrupted cleanly, and without external arcing or contact burning. Because of its unmatched design this device requires approximately one third the space needed for more conventional interrupting equipment.

Air Interrupter ISOLATORS are standard to 15 kilovolts and 600 amperes continuous rating.

SAVES POT HEAD INSTALLATION

If incoming power is supplied through a cable, the same economies can be effected. Pictured at right is an Air Interrupter Cable ISOLATOR with flanged throat for mounting on corresponding throat of transformer. Generally two separate pieces of equipment are required, a pothead for cable termination and an interrupter switch. The Air Interrupter Cable ISOLATOR provides both facilities making additional savings of space and materials possible.



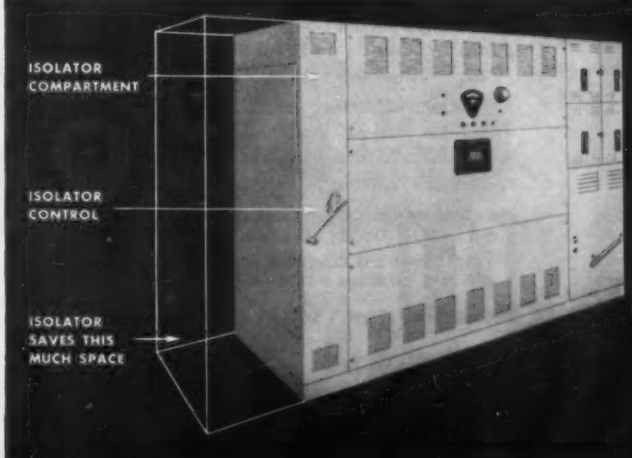
Three pole single throw 400 ampere 15 kilovolt Air Interrupter Cable ISOLATOR with transformer connection.

Send for our new bulletin 138.

SORGEL SAVES WITH ISOLATORS TO INTERRUPT MAGNETIZING CURRENTS

Below is shown one end of a 2000 K.V.A. Double End Unit Substation built by the Sorgel Electric Co., a prominent Transformer Manufacturer of Milwaukee, Wisconsin. Here they used Air Interrupter ISOLATORS to good advantage, for interrupting magnetizing current of each 1000 K.V.A. three phase, 13800 volt primary, air cooled transformer, and to isolate same from power source.

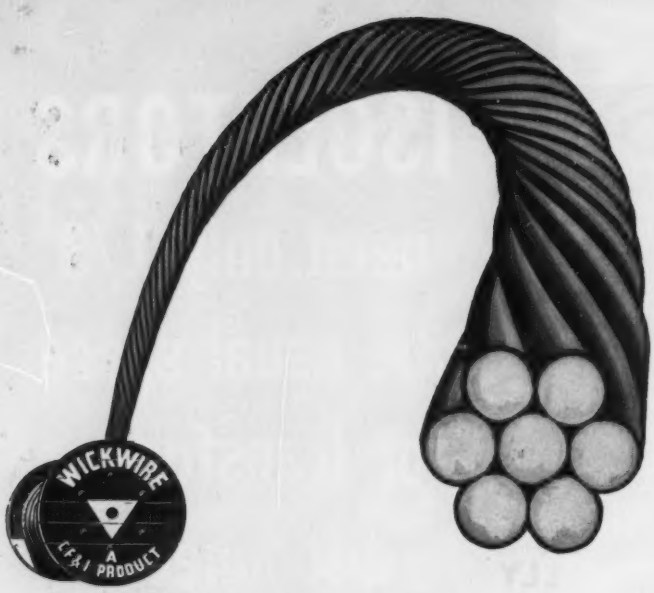
The ISOLATOR compartment was made considerably smaller than what would have been required if other types of interrupting equipment were used. Valuable space was saved, as well as steel required for building compartment.



ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

THREE E



CF&I GALVANIZED STEEL STRAND

for guy, messenger and ground wires

You'll find that an ever-increasing number of public utilities, transit companies and similar organizations are depending upon CF&I for their guy, messenger and weldless overhead ground wire requirements.

That's because CF&I offers a complete line of top-quality galvanized 7-wire* twisted steel strand that's carefully quality-controlled by CF&I throughout *every* stage of production. This quality control is important to you! It's your assurance that CF&I Strand is always made from steel that has exactly the right chemical and physical properties to fill your needs . . . and that this steel is carefully drawn, galvanized and stranded into a product that'll give years of satisfying service.

Next time you need strand, talk over your requirements with your nearby CF&I representative. He'll be happy to give you complete details on the CF&I Strand that's best for your job.

CF&I Strand For Public Utility And Similar Applications Fully Meets Or Exceeds The Latest Applicable ASTM Specification (A-122 For Guy And Messenger Wire; A-363 For *Weldless* Overhead Ground Wire).

*Also available in 3-wire construction.

3740

CF&I

WICKWIRE SPENCER STEEL DIVISION · Atlanta · Boston · Buffalo · Chicago Detroit · New Orleans · New York · Philadelphia

THE COLORADO FUEL AND IRON CORPORATION · Albuquerque · Amarillo Billings · Boise · Butte · Casper · Denver · El Paso · Ft. Worth · Houston Lincoln (Neb.) · Los Angeles · Oakland · Oklahoma City · Phoenix · Portland Pueblo · Salt Lake City · San Francisco · Seattle · Spokane · Wichita

More New Products

(*Continued from page* 244)

General Dynamics Corp, Bayonne, N. J., has added 254U and 256U frames to its line of rerated totally enclosed non-ventilated and totally enclosed **fan-cooled motors** (EW, Dec. 12, 1955, p 154).

Electric Storage Battery Co, Exide Industrial Division, Box 8109, Philadelphia 1, Pa., has introduced flat-plate motive power **batteries** for electric industrial fork and lift trucks.

Lincoln Electric Co, Cleveland, Ohio, has an all-position **electrode** (E-6013) for ac or dc current. It is available in ⅛, 5/32 and 3/16-in. sizes.

General Radio Co, 275 Massachusetts Ave, Cambridge 39, Mass., has a Type 5 Variac **autotransformer.** Two and three-gang assemblies of both 115 and 230-v Variacs are available in enclosed or open models.

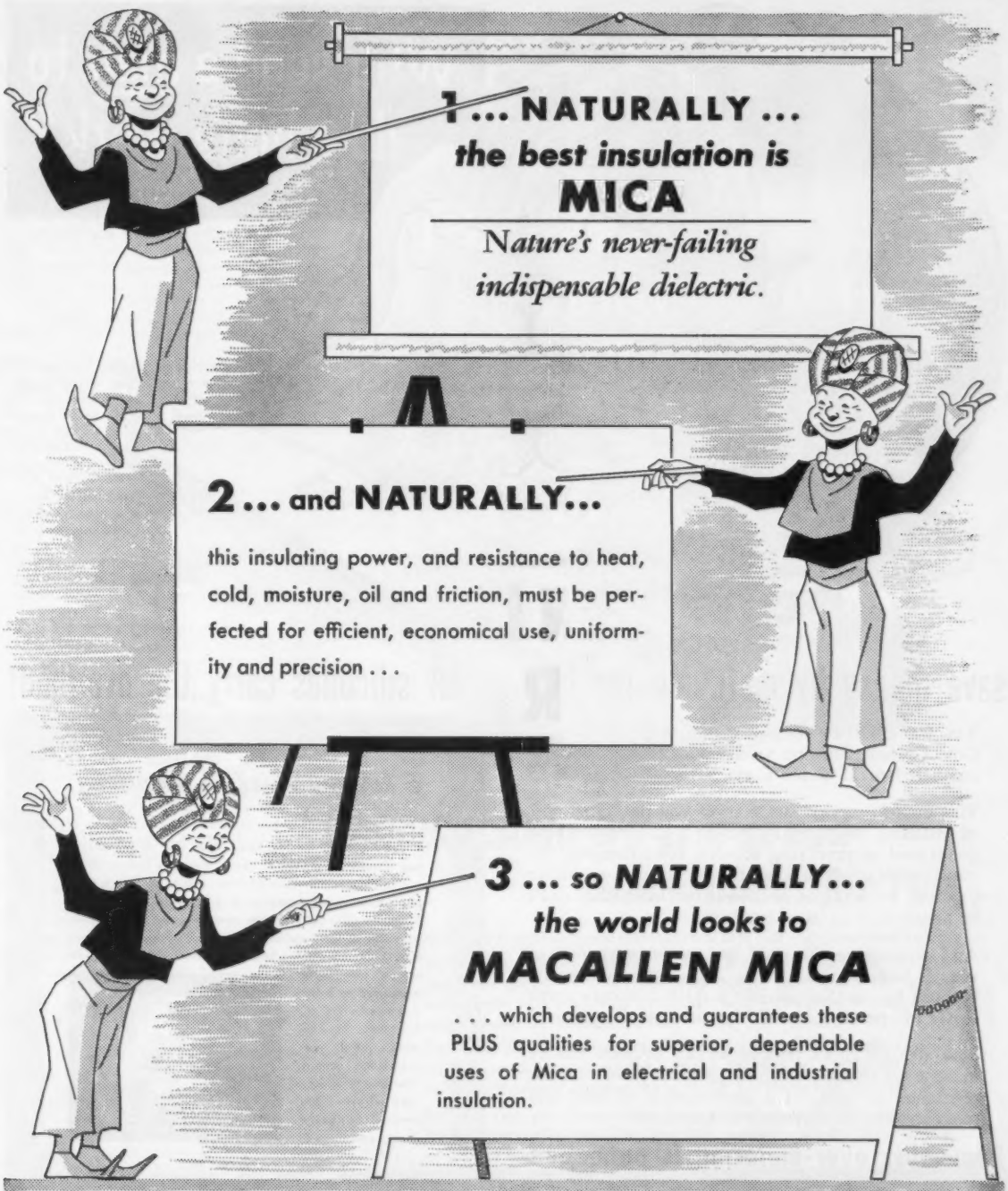
General Electric Co, Schenectady 5, N. Y., has fractional horsepower **motor-generator sets** in frame sizes 44, 66 and 74. The Type LB sets are available in various input combinations of standard frequencies, voltages, and phases, and with 250, 500 and 750-w dc outputs.

Fenway Machine Co, Edgemont & Clementine Sts, Philadelphia 34, Pa., has a 13-lb **portable Nibbler** (Model HN) for precision cutting of stainless steel up to 10 gauge, and milder steels and non-ferrous metals to 8 gauge.

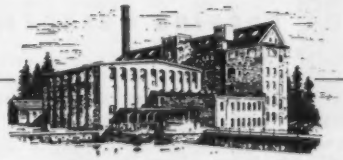
Portable Electric Tools, Inc, 320 W. 83rd St, Chicago 20 Ill., has two **portable power saws** with many safety features. Model 601 weighs 6 lb and cuts 1⅝ in. at 90 deg and 1⅜ in. at 45 deg. Model 635M weighs 10½ lb and cuts 2¼ in. at 90 deg and 1⅞ in. at 45 deg.

General Electric Co, Pittsfield, Mass., has a **pressure-contact adhesive** (Type AA) that makes a water-resistant, resilient, durable bond for spray applications.

Century Electric Co, 1806 Pine St, St. Louis 1, Mo., has introduced a 1/20 to ⅓-hp **48-frame motor** line for industrial use.


1 ... NATURALLY ...
the best insulation is
MICA
Nature's never-failing
indispensable dielectric.
2 ... and NATURALLY...
this insulating power, and resistance to heat, cold, moisture, oil and friction, must be perfected for efficient, economical use, uniformity and precision . . .
3 ... so NATURALLY...
the world looks to
MACALLEN MICA
. . . which develops and guarantees these PLUS qualities for superior, dependable uses of Mica in electrical and industrial insulation.

THE MACALLEN COMPANY



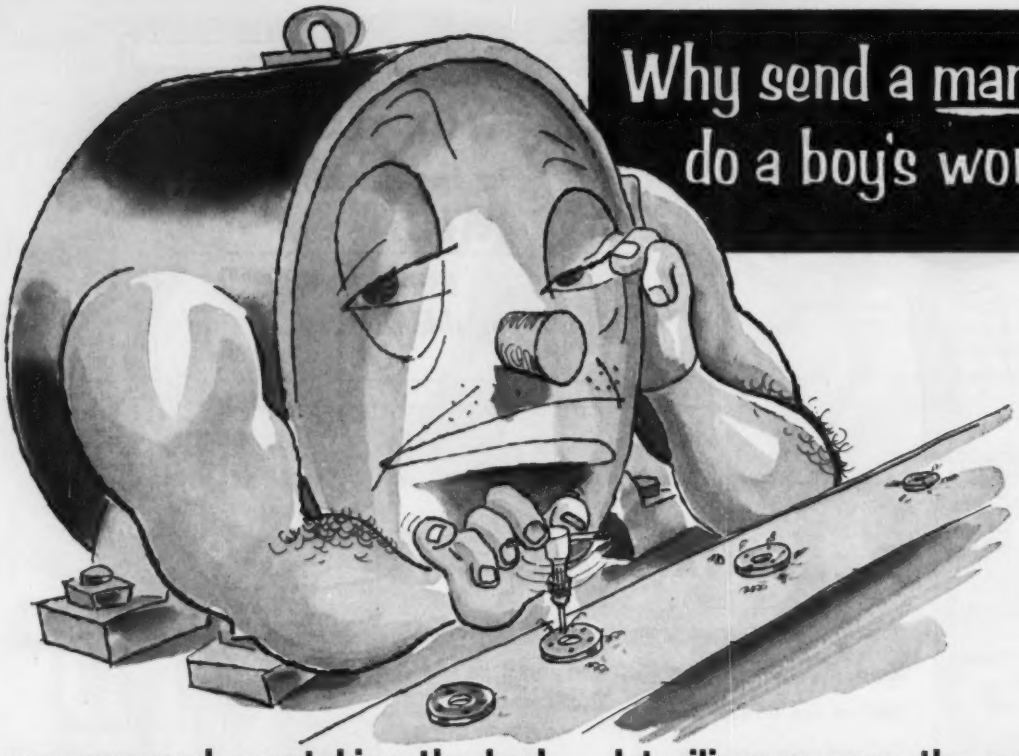
BAY ROAD, NEWMARKET, NEW HAMPSHIRE

when you think of MICA . . . think of MACALLEN

MACALLEN MICA

ALL FORMS • ALL QUANTITIES • ALL DEPENDABLE

CHICAGO: 565 W. WASHINGTON BOULEVARD • CLEVELAND: 1231 SUPERIOR AVENUE



Why send a man to do a boy's work?

save money by matching the load . . . let silicones carry the overload!

You get a service factor ranging up to 50% with Dow Corning Silicone insulated (Class H) motors compared to 15% for Class A.

This built-in service factor saves you the initial cost of installing oversized motors to withstand the heat generated in reversing service, for example. In many applications, it saves the cost of over-motoring to carry intermittent overloads, or loads that can't be matched in standard frame sizes.

And eliminating the need for over-motoring gives you a better power factor and higher efficiency, because the smaller silicone insulated motors come closer to operating at full load most of the time.

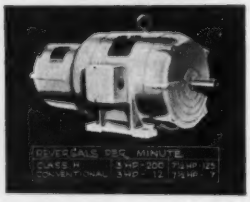
You also get more reliable service because motors insulated with Dow Corning silicones have superior resistance to heat, to a combination of heat and moisture, and to corrosive atmospheres.

Remember over-motoring is outmoded

to help you speed up production

LOUIS ALLIS

The Louis Allis Co. of Milwaukee has developed a line of rapid reversing motors which are silicone insulated and blower cooled to give a maximum number of reversals. A 3 hp Class H motor, for example, will do 200 idle reversals per minute compared to 12 for a conventional motor of the same frame size. A 7½ hp silicone insulated motor will do 125 idle reversals per minute compared to 7 for a conventional motor. These motors offer new production economies in any operation where high reversal capacity is required.



Dow Corning Corporation, Dept. 4401, Midland, Mich.

Please send me sources of supply for new Silicone (Class H) ☐ Motors ☐ Transformers

☐ Information on Louis Allis motors for rapid reversing service

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

DOW CORNING SILICONES

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT
LOS ANGELES • NEW YORK • WASHINGTON, D.C. (Silver Spring, Md.)

CANADA: Dow Corning Silicones Ltd., Toronto
GREAT BRITAIN: Midland Silicones Ltd., London
FRANCE: St. Gobain, Paris

CATALOGS—BULLETINS

• **FITTINGS:** Line of fittings for wire rope and chain is shown in 28-page Catalog No. 950-1. Included are engineering data, charts, dimensions, and safety factors for links, rings, shackles, swivels, hooks, turnbuckles, thimbles, clips, sockets, ring bolts, eyes, and load binders. American Hoist & Derrick Co, Thomas Laughlin Division, Portland, Me.

• **BERYLIUM COPPER STRIP:** Bulletin No. 6 (12 pages) describes engineering properties and applications of a line of beryllium copper strip. Discussion of available alloys, tempers, sizes, and tolerances is included. Penn Precision Products, Inc, 501 Crescent Ave, Reading, Pa.

• **GLASS FIBER PRODUCTS:** Form WPD-11 (8 pages) describes a line of glass fiber products for electrical insulations, vibration and shock control, and other applications. Engineering data and illustrations are included. LOF Glass Fibers Co, 1810 Madison Ave, Toledo, Ohio.

• **LAMP BALLASTS:** Line of fluorescent lamp ballasts is covered in a 12-page booklet and selection guide. Catalog No. GEC-983G contains wiring diagrams for ballasting circuits, cross-section dimensions, and electrical specifications of the line. General Electric Co, Schenectady 5, N. Y.

• **PUSH-BUTTON ACTUATORS:** Data Sheet P99a (2 pages) gives characteristics and uses of a line of push-button actuators for snap-action switches. Mounting diagrams are included. Minneapolis-Honeywell Regulator Co, Micro Switch Division, Freeport, Ill.

• **PIPING ANALYSIS:** How power piping costs can be reduced is the subject of a 12-page brochure titled "Piping Flexibility Analysis." A method of analysis is discussed, and a typical piping problem is solved two ways. M. W. Kellogg Co, 225 Broadway, New York, N. Y.

• **ELECTRICAL FITTINGS:** Line of solderless fittings and electrical hardware is described in 4-page Bulletin No. 561. Specifications, dimensional data, and application instructions are included. Buchanan Electrical Products Corp, Hillside, N. J.

• **CARTRIDGE HEATING:** Bulletin No. 101 (2 pages) deals with precision cartridge heating units utilizing stainless steel as sheathing material. Sizes, ratings and uses are given. Hotwatt, Inc, 16 Gould St, Danvers, Mass.

• **LIGHTING STANDARDS:** Design features and specifications of a line of outdoor aluminum lighting standards are contained in catalog titled "Hapco." Hubbard Aluminum Products Co, 6301 Butler St, Pittsburgh 1, Pa.

• **SUMP PUMPS:** Bulletin No. 4500 describes a redesigned line of sump pumps for 2 to 11-ft depths. Pumps range in discharge sizes from 1.5 to 6 in. with capacities to 1,000 gpm and heads to 75 ft. Deming Co, Salem, Ohio.

• **ELECTRIC HEATING:** Applications of heating cable, straight or formed tubular heaters, flat or curved strip heaters, cartridge type heaters, and finned or im-

(*Continued on page* 250)

5000 WD
the New
YORK-HOOVER TWO-MAN LINE BODY

model 5000 WD is a sound investment for YOU...

because it will do your line work *at less cost—quicker* and *safer.*

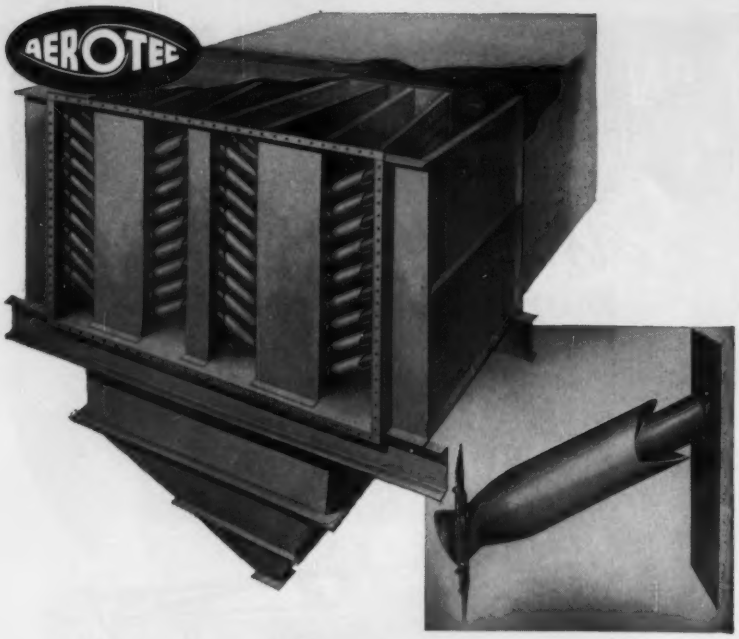
With complete equipment it will dig the hole and set the pole, normally in a matter of minutes, all within full view and control of the truck operator, and—*the pole derrick is always ready for immediate use.*

Backed by 61 years' experience and embodying skillful engineering and honest workmanship, the model 5000 WD body with equipment represents a truly outstanding investment.

Before you purchase any line equipment, make sure you have thoroughly looked into this modern, up-to-the-minute unit by York-Hoover.

YORK-HOOVER
PUBLIC UTILITY BODIES

YORK-HOOVER CORPORATION
BODY DIVISION
YORK, PENNSYLVANIA



longer life for

MECHANICAL DUST COLLECTORS

New Aerotec Tube Offers

- **Higher Efficiency**
- **Erosion Resistance**
- **Simplified Field Erection**
- **Low Maintenance**

The new Aerotec 5" Tube of white cast iron assures extremely high dust collector efficiency and in service far exceeds tubes of other basic metals. Accelerated tests conducted by Aerotec engineers have proven conclusively that white iron is superior in reducing wear, even when caused by the most highly abrasive particles.

Tubes are factory assembled into "building block" elements to simplify field erection. In addition, the inherent design of the 5" Tube reduces the possibility of plugging, even at low temperatures, or when the fuel has a high sulphur content. Years of research behind the development of this tube now assure a collector that requires minimum maintenance.

For information about the new Aerotec Tube, call or write to The Thermix Corporation, Project Engineers for Aerotec.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.
(Offices in 38 principal cities)
Canadian Affiliation: T. C. SHOWN, LTD., 1440 S. Catherine St. W., Montreal, Que.

Manufacturers
THE AEROTEC CORPORATION
Greenwich, Conn.

Catalogs-Bulletins

(*Continued from page* 249)

mersion heaters to industrial winter heating problems are described in 16-page Booklet No. F1575. Edwin L. Wiegand Co, 7500 Thomas Blvd, Pittsburgh 8, Pa.

● **POWER DERRICKS:** Performance charts, dimensional drawings, and operating features for rear-mounted and front-mounted derricks to lift loads up to 6,500 lb are given in 4-page bulletin on Series 4700 power derricks. J. H. Holan Corp, 4100 W. 150th St, Cleveland 11, Ohio.

● **TACHOMETERS:** Line of stationary tachometers, which have new circuits and take-off heads said to increase life by five times, is described in 4-page Bulletin No. 105. Metron Instrument Co, 432 Lincoln St, Denver 3, Colo.

● **SILICONE PRODUCTS:** About 150 silicone products are described in 12-page Bulletin No. 1-110. It is illustrated with charts, tables, graphs and application photographs. Dow Corning Corp, Midland, Mich.

● **PROCESS PUMPS:** Line of vertically split, single-stage and two-stage process pumps is described in 20-page Form 7094-B. Range of coverage is from 1 to 8 in., including capacities to 3,200 gpm, heads to 925 ft, at temperatures to 800F. Design features, dimension tables, cross sectional and installation views are included. Ingersoll-Rand Co, 11 Broadway, New York 4, N. Y.

● **GENERATOR BRUSH:** General purpose industrial motor and generator brush is described in 8-page Form CP-2694. Graph comparing commutating ability versus brush life is included. National Carbon Co, Division of Union Carbide & Carbon Corp, 30 E. 42nd St, New York 17, N. Y.

● **TEST EQUIPMENT:** Units for overpotential testing and power supply use, along with standard meters, high voltage voltmeters, shunts, transformers, phase sequence indicators, and other special electrical equipment are described in a 20-page catalog. Davenport Mfg Co, Dept EWN, 1713 N. Ashland Ave, Chicago 22.

● **GRATING:** Uses of steel, aluminum and stainless grating and stair treads are described in an illustrated booklet. Klemp Metal Grating Corp, Dept SP, 6601 S. Melvina Ave, Chicago 38, Ill.

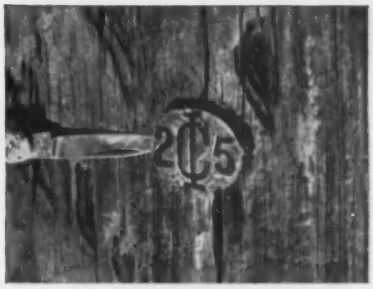
● **WIREWAYS:** Line of 4 by 4-in. and 6 by 6-in. metal raceways is described in 20-page Catalog No. 445. Photographs, dimensions and methods of installation are given. National Electric Products Corp, Pittsburgh 22, Pa.

● **SOLENOID PILOTS:** Several types of solenoid pilots for use with a line of regulating valves are described. Applications and uses are given in Form No. 1010. Spence Engineering Co, Inc, Walden, N. Y.

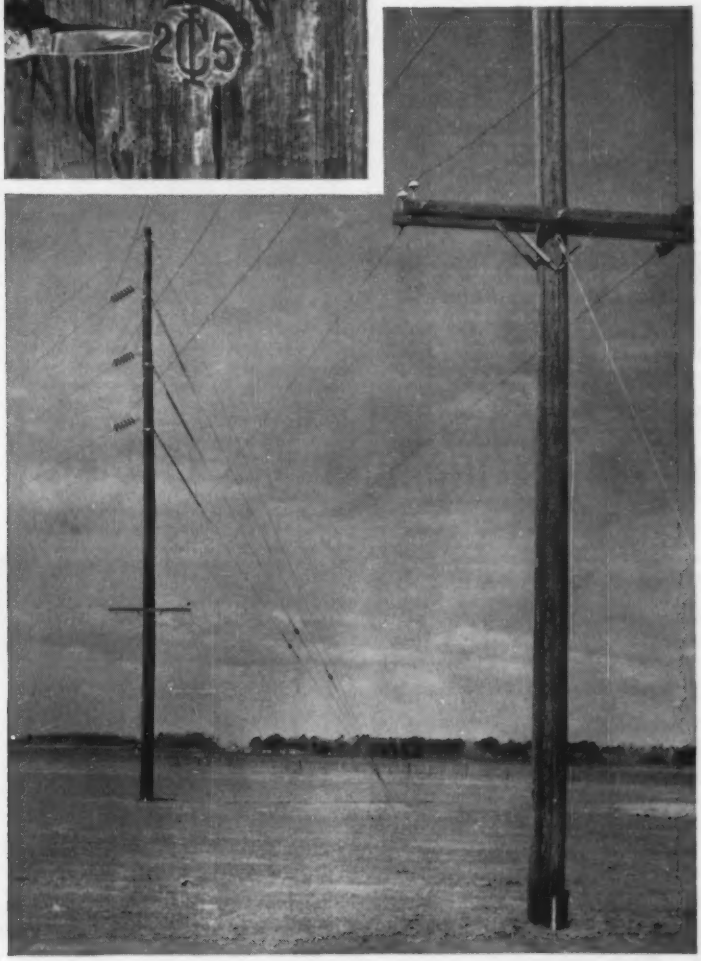
● **SOLENOID VALVES:** Form V5006 (2 pages) describes a 1-in. size 2-way solenoid valve that handles corrosive fluids and gases. Form V5010 (2 pages) describes a midget size 3-way solenoid valve that has explosion-proof approvals and higher pressure ratings. Automatic Switch Co, 391 Lakeside Ave, Orange, N. J.

Here's Proof of Performance...

Gulf States Utilities counts on over 30 years of service from *pressure-creosoted* poles



• One of the many poles marked with a 1925 dating nail, denoting 30 years of service.



Gulf States Utilities Company, serving 291 communities in southeastern Texas and south central Louisiana, uses pressure-creosoted poles exclusively in more than 10,000 miles of transmission and distribution lines.

"It would be foolish to think of putting an untreated pole in the wet, termite-infested soil of the Gulf Coast area," says John Jordan, operating supervisor. "We have come to expect over 30 years of service from a pressure-creosoted pole."

Gulf States used pressure-creosoted poles in its first inter-city line installed in 1917. Some of these poles are still in use today after removal to other locations.

"First cost of a pole is reason enough to take advantage of Creosote's ability to make poles last," says Mr. Jordan. "But a replacement is even more expensive when you consider it takes 50 to 60 man-hours to make a pole change."

With poles pressure-creosoted for adequate life, neither the utility nor its linemen have cleanliness complaints.

For best performance, from the standpoints of service and cleanliness, specify poles treated with the top-quality preservative—USS Creosote. For more information, contact our nearest Coal Chemical sales office or write directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

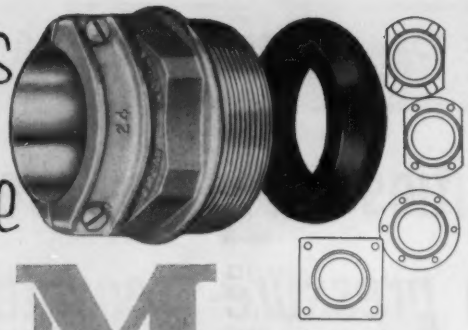
You can obtain clean pressure-creosoted poles upon specification and with proper inspection without sacrificing pole service life.

SEE THE UNITED STATES STEEL HOUR. A full-hour TV program presented every other week by United States Steel. Consult local newspaper for time and station.

USS CREOSOTE

UNITED STATES STEEL

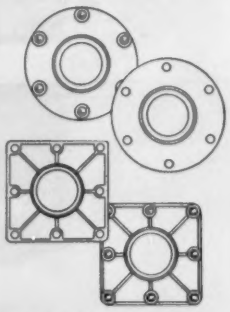
unusual needs
in
unusual time
FROM
PLM



PLM Armored Cable Terminators are supplied with many types of flange mountings, or for mounting through structures.

● Special needs don't have to mean special problems. PLM terminators and splicing accessories for armored cable include a wide variety of types for many uses... can be modified or supplied on special order for many other needs.

Put your problems up to PLM. Whether your specifications call for standard or special items for terminating or splicing of armored, rubber-insulated or lead-covered cable through 23 kv, you'll find fast and efficient help. Write, wire or phone. Catalog on request.



PLM Products, Inc.
3873 West 150th St. • Cleveland 11, Ohio
WIRE AND CABLE FITTINGS AND ACCESSORIES
Armored Cable Terminators • Splicing and Terminating Kits • Conduit Ventilators

Save up to 85%
brush handling costs

M & M Brush Grinder rapidly converts brush to chips and reduces piling, trucking, and burning costs.

Cut labor and truck operating costs as much as 85%. M & M Brush Grinder chews brush and branches up to 6" in diameter into small chips and automatically blows them over the ground or into a truck. Compact, portable unit with its own power plant. Haul it right to the job by jeep, or truck. Fully enclosed mechanism is protected from dust and dirt and completely safe. Sturdy construction for long, satisfactory service. Write today for illustrated folder.

MITTS & MERRILL 85
1002 South Water St. • Saginaw, Michigan

TECHNICAL LITERATURE

EEI REPORTS—Following reports were published recently by Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.:

● Instruments and Controls Practices for Recent Single Boiler Turbine Reheat Installations, No. 55-21. This 43-page report of the EEI Prime Movers Committee deals with: Company policy; use of centralized and decentralized control rooms and areas; manpower requirements; general features of control rooms and control boards; and boiler, turbine and general controls. Data sheets on instruments and controls practices for recent single boiler turbine reheat installations are included. Price $2.00 to non-members in U. S.

● Effects of an Atomic Blast on Electric Power Facilities, No. 55-17. This 19-page report presents the detailed findings of the EEI Nevada Atomic Test Committee following the May 1955 atomic tests on electric transmission and distribution systems. The test installations are described, and results and conclusions are discussed. Price 75¢.

ELECTRICAL STANDARDS—"The 400 American Standards in the Electrical Field" is a 60-page booklet which indexes and describes each American Standard in the electrical engineering area. Briefs of current International Electrotechnical Commission recommendations and a listing of all projects under jurisdiction of the Electrical Standards Board are included. American Standards Association, 70 E. 45th St, New York 17, N. Y. No charge.

NEMA STANDARDS—Following publications were issued recently by National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.:

● American Standard for Electrical Indicating Instruments, C39.1-1955. This standard applies to ammeters, voltmeters, wattmeters, varmeters, frequency meters, power-factor meters, and indicating instruments that function on these principles but indicate derived quantities. The 48-page book defines terms and describes general and test requirements. Price $2.00.

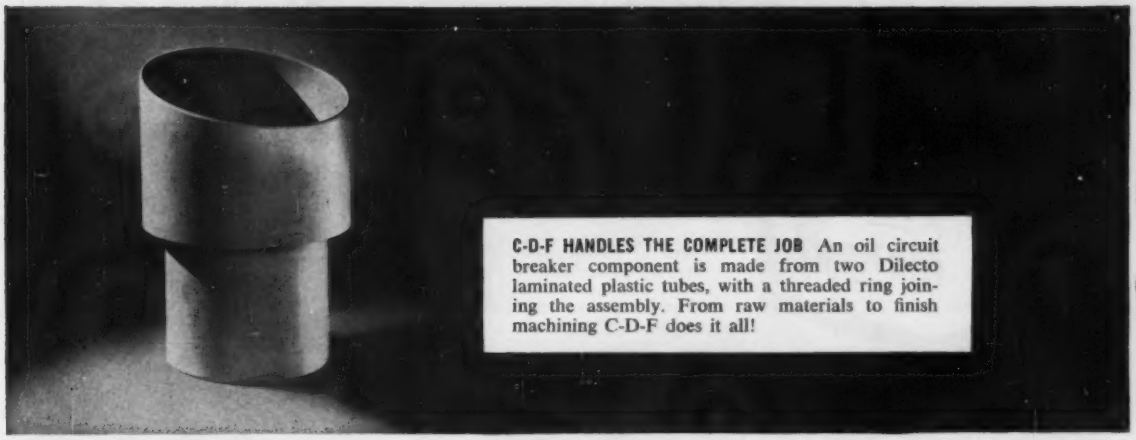
● NEMA Standards Publication for Electric Fans, FM 1-1955. Rating, manufacture, performance and testing of free-air circulating fans and ventilating fans are covered in this 36-page booklet. Price $3.00.

FOUNDATION BIBLIOGRAPHY—Revised list of 175 annotated references to selected books and periodicals published from 1924 to 1955 is contained in "ESL Bibliography No. 11." It covers theory, design, construction, specific problems, and vibration of foundations of electrical and other types of machinery. Engineering Societies Library, 29 W. 39th St, New York 18, N. Y. Price $2.00.

V-BELT DRIVES—A 24-page revised manual of recommended "Engineering Standards Multiple V-Belt Drives" indicates proper sheaves and belts to be used for optimum efficiency and economy. New horsepower ratings and their basic formulas are given. Rubber Manufacturers' Association, Inc, 444 Madison Ave, New York 22, N. Y. Price $1.00.

MAGNETOSTRICTION TRANSDUCERS—A 38-page illustrated booklet is titled

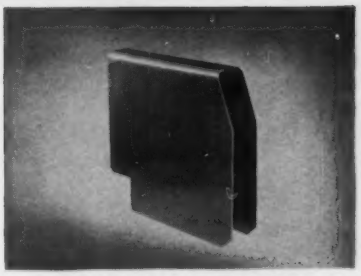
(*Continued on page* 254)



C-D-F HANDLES THE COMPLETE JOB An oil circuit breaker component is made from two Dilecto laminated plastic tubes, with a threaded ring joining the assembly. From raw materials to finish machining C-D-F does it all!

C-D-F KNOWS HOW TO MACHINE PLASTICS. A bus bar gets a covering of molded Dilecto over copper supplied by the customer. The plastic ends are skillfully trimmed on a smooth saw.

C-D-F MOLDS MANY SPECIALTIES. This shaft insulator for a circuit breaker is molded from C-D-F's cloth-based industrial thermosetting plastic, Celoron. Note complexity of mold, clean detailing.

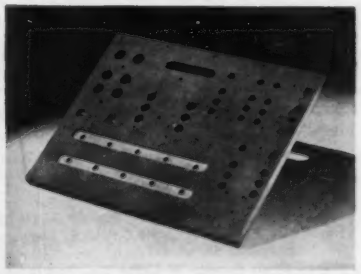


C-D-F USES MODERN METHODS. Large quantities of arc chute barriers are made from paper-based Dilecto. Operations include pressing, cutting, post-forming and trimming.

Dependable equipment relies on C-D-F insulation!

C-D-F OFFERS UNIQUE MATERIALS. This contact shaft for an air circuit breaker is another example of molded C-D-F Celoron used in switchgear because of its high impact strength.

C-D-F IS A SKILLFUL ASSEMBLER. Made from Grade C rolled Dilecto tubing, these pots are turned, bored, slotted. Then a macerated plastic end is inserted and arc resistant varnish finish applied.



C-D-F UNDERSTANDS THE ELECTRICAL INDUSTRY'S NEEDS. Precisely machined to close tolerances, Dilecto panel boards guarantee dependable insulation, help designers save space.

See our catalog in Sweet's Design File for basic product data and sales offices. Write for detailed information, or send us your print for quotation.

CONTINENTAL DIAMOND FIBRE

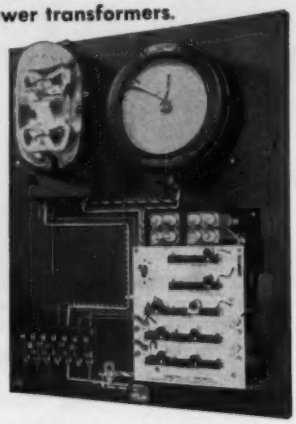
CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 15, DELAWARE

Transformer Loss Compensator

Saves you Money!

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.



This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.

Some of the Users . . .

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Technical Literature

(*Continued from page* 252)

"Design of Nickel Magnetostriction Transducers." It summarizes practical experiments to guide the engineer toward a workable design in sonic and ultrasonic regions. International Nickel Co, Inc, 67 Wall St, New York 5, N. Y. No charge.

HARDNESS CONVERSION—Approximate relation between hardness and tensile strength of carbon and alloy steels is shown on Technical Data Card No. 183. Hardness systems covered are Brinell, Monotron, Vickers, and Rockwell B, C and E Scales. Babcock & Wilcox Co, Tubular Products Division, Beaver Falls, Pa. No charge.

TEMPERATURE CONVERSION—Thermocouple temperature millivolt equivalents are given in "Standard Conversion Tables," Booklet No. F7255. Temperatures are expressed on the International Temperature Scale of 1948, and electromotive force is in absolute units. Barber-Colman Co, Wheelco Instruments Division, Rockford, Ill. No charge.

POTENTIOMETERS — "Symposium of Technical Articles" covers all phases of precision potentiometer design and application. Graphs and charts of electrical and physical design characteristics are included. George W. Borg Corp, Janesville, Wis. No charge.

FIRE EXTINGUISHMENT—"The Mechanism of Extinguishment of Fire by Finely Divided Water" deals with the fundamental factors of extinguishing fire with water sprays. Results of extensive tests are discussed. National Board of Fire Underwriters, 85 John St, New York 38, N.Y. No charge.

ASTM REPORTS—Following were released recently by American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.:

- Determination of Shear Stability of Non-Newtonian Liquids, STP No. 182. Polymer liquids and mechanical devices in which they are used are covered in this 12-page report. It gives data from a cooperative effort to develop a suitable test method for measuring shear stability of polymer liquids. Price 75¢.
- 1954 Supplement to the Bibliography and Abstracts on Electrical Contacts, STP No. 56-I. This 48-page book includes references on electrical contacts that were collected between Jan. 1954 and Jan. 1955. Price $1.00.
- Elevated Temperature Properties of Carbon Steels, STP No. 180. This 68-page book includes data for tensile and yield strength, elongation and reduction of area, stresses for creep rates of 0.0001 and 0.00001% per hr, and rupture strengths for 100, 1,000, 10,000 and 100,000 hr. Price $3.75.
- Specifications and Tests for Electrodeposited Metallic Coatings. This 104-page compilation of 17 specifications, methods of test, and recommended practices embodies work of ASTM Committee B-8 on Electrodeposited Metallic Coatings. Price $1.85.
- Specifications for Steel Piping Materials. The 1955 edition (432 pages) of this compilation sponsored by ASTM Committee A-1 on Steel contains the latest approved form of 58 specifications for ferrous pipe, tubes, castings, fittings, and bolting material. Price $4.00.

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makes sealing easier!

New Johns-Manville Volseal is a high dielectric putty designed for sealing heavy cables and irregularly shaped objects. It has a dielectric of 445 vpm, together with excellent physical properties. Resists acids and alkalis, weathers well, is highly resistant to water, does not corrode metals.

Volseal also offers easy application. It is highly elastic, provides good adhesion, hardens within 3 hours on air curing. Available in extruded beads, ribbons and pugs. For complete details on Volseal and its new companion product Napseal, the petroleum resistant sealing compound, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

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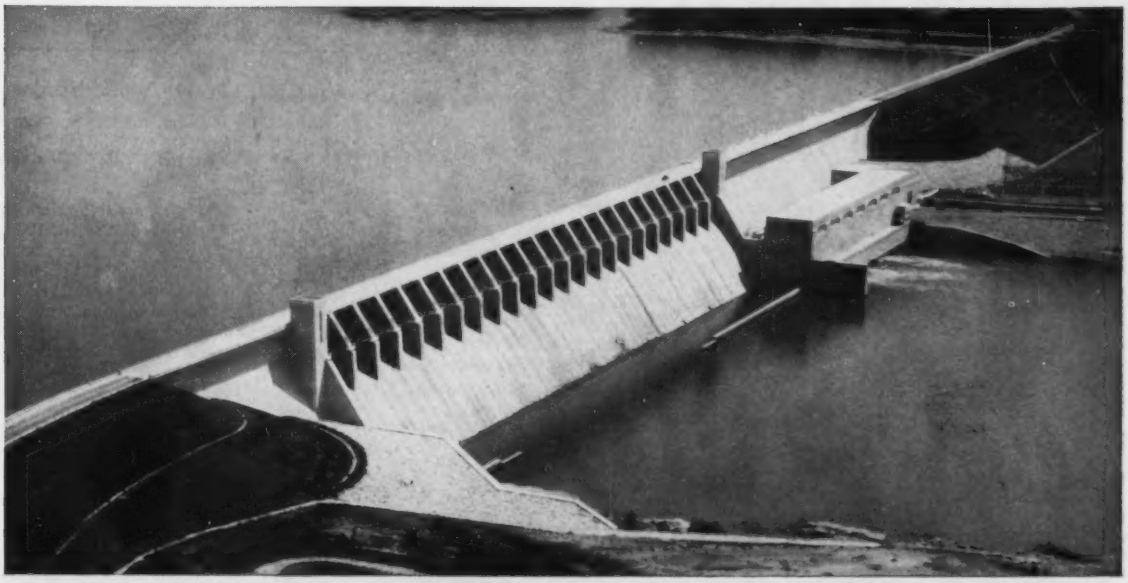

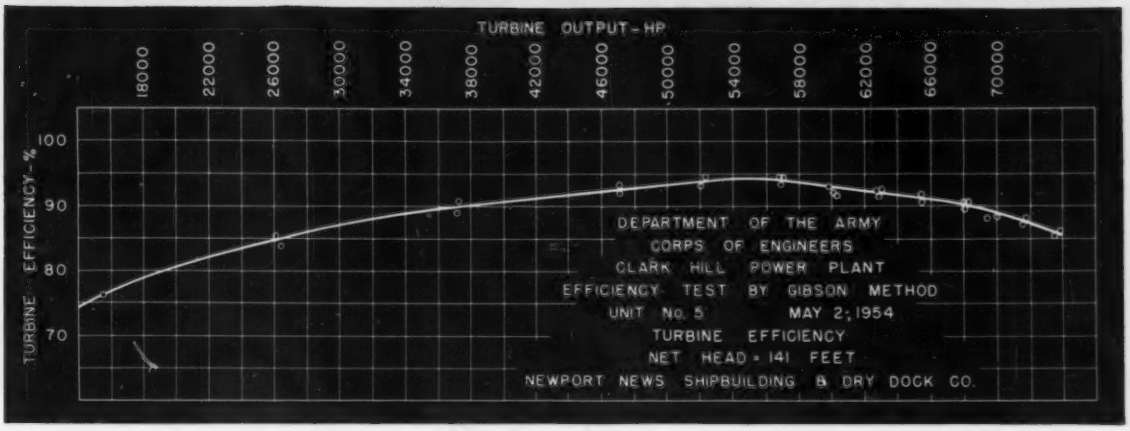

Maximum efficiency of 94.1%

Reflects advanced practices at Newport News

THE GRAPH shows performance of a 55,000 horsepower turbine, one of seven such units built by Newport News for the Clark Hill Power Plant (see photo).

Shape of the curve is typical . . . not exceptional . . . for Newport News turbine performance. Regular, uniform, showing no-cut-off at full load, it indicates consistent delivery and stable operation.

And especially, experience in design and model testing.

At Newport News, turbine runners are continually being designed and redesigned for improvements in performance. And often upon receiving a contract for turbines, a model setting is built and complete tests made. So far, Newport News has filled turbine contracts with an aggregate rated output in excess of 7,000,000 horsepower.

Penstocks, spiral casings, valves, pumps, rack rakes and other essentials are also designed and built by Newport News. Our illustrated booklet, "WATER POWER EQUIPMENT," will be sent to you upon request.

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. . . gains many a victory — for manufacturers as well as for the military. In photoelectric lighting controls, for example, Fisher-Pierce was among the first (1945-6) to give street lighting engineers a sound, *dependable* group of controls.

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BOOKS

Making Concrete Work Harder

Prestressed Concrete—3rd Edition. By Gustave Magnel. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St., New York 36, N. Y. 351 pages, illustrated. Price $8.00.

Twice revised since publication in Europe of the first edition in 1948, this is claimed to be the leading book about prestressed concrete yet published by an outstanding authority. Changes are those required to incorporate new developments, a greater variety of design information for designers of beams, and recent experimental data. The last two chapters contain many good examples of prestressed concrete in bridges, buildings, tanks and foundations, together with design data and methods of fabrication.

Material retained from earlier editions includes brief coverage of the principles and methods of prestressing. But the major portion of the book is devoted to a thorough presentation of design methods, tests, strength limits, and the effect of sustained loading. Readers need a working knowledge of structures and mathematics through the calculus.

This book merits study by every designer and builder of reinforced concrete structures. But utility applications would be limited largely to applications of concrete in power stations and substations.

How to Run Power Plants

Power Plant Management. By R. H. Emerick. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 339 pages, illustrated. Price $6.50.

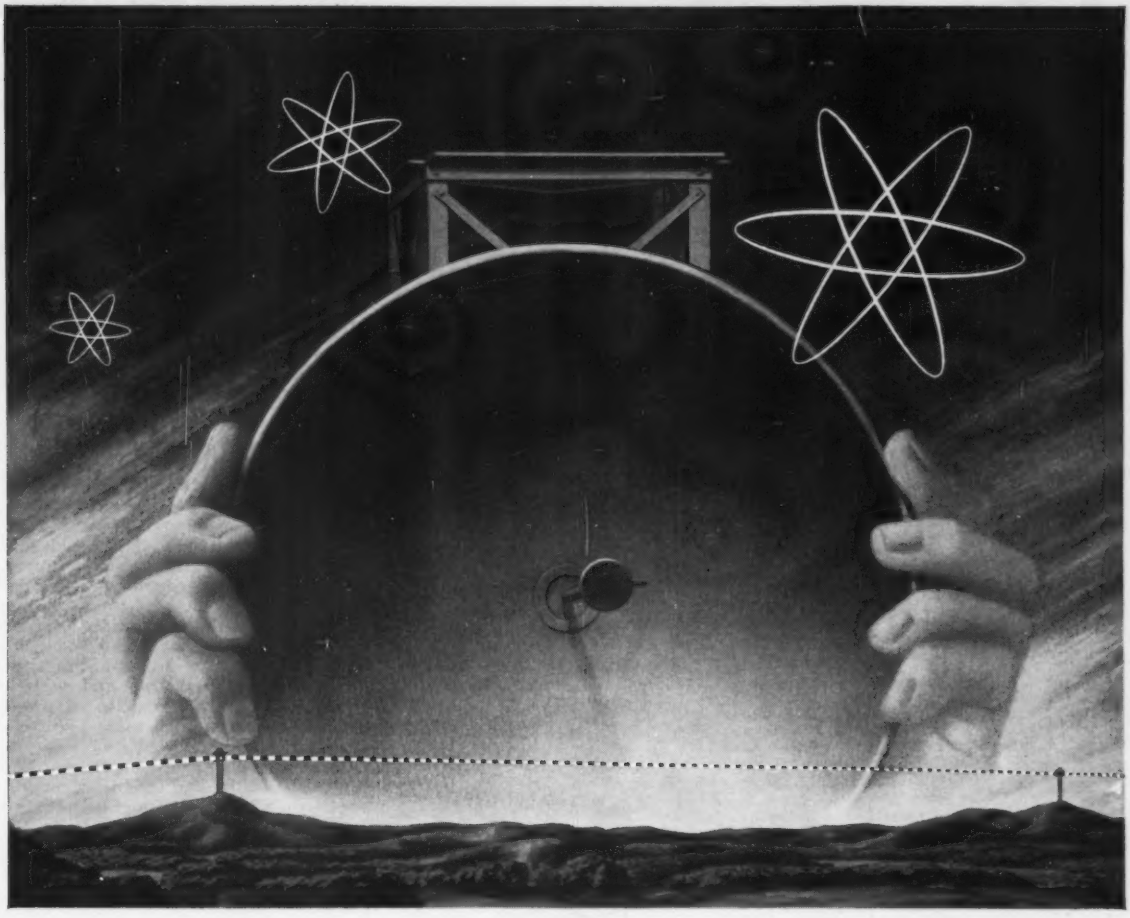
This excellent book gives management basic engineering facts upon which to make decisions concerning the selection, design, and operation of power plant equipment. Book is divided into three sections: problems of plant design, problems of administration, and problems of operation. It is primarily written for the smaller industrial plant operator rather than utility management. However it should also prove valuable to the latter group, and knowledge of its contents may help plant designers to understand management's part in the overall picture.

First section of the book deals with such problems as buying vs making power, and indoor vs outdoor design. Economics is of course heavily stressed. Most difficult mathematics in the book is multiplication. Other topics discussed are selecting best means of power generation, fuel storage and handling, preparing specifications, and buying used equipment.

The second section deals with organization, safety, training, and per-

(*Continued on page* 258)

FEDERAL MICROWAVE—"*CERTIFIED BY A WORLD OF RESEARCH*"



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This is a vital question for microwave buyers in this electronic and atomic age, when science, industry, and communication are moving forward so rapidly. Before the final decision is made there should be assurance that microwave techniques will keep in step... always be ready to *interwork with progress!*

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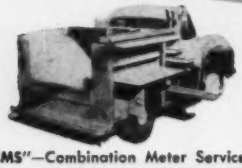
YOU NEED IN A BODY TO GIVE YOU LOWER COST RESULTS

"SM"—Service Maintenance Bodies 74" to 104" long by 74" to 89" wide. Completely equipped with tool and parts storage for efficient operation.

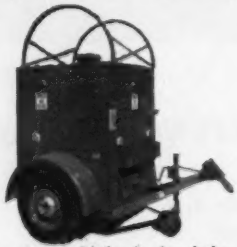


"CMS"—Combination Meter Service Bodies 74" to 104" long by 74" to 89" wide. Transverse through compartment at front of body for carrying electric or gas meters. Capacity 12 to 36 electric meters or 5 to 16 gas meters. Two small parts drawers with removable dividers.

"SML"—Service Maintenance Ladder Bodies built to carry a ladder of your specifications. Complete with warning system and flashing lights. Compartment installations the same as "SM" Series Bodies.

"PLCC"—Combination Platform and Line Body with crew cab. Bodies of many different custom designs with or without crew cabs. Increases utility use of platform bodies with or without diggers.

"LC"—Line Construction Bodies with or without crew compartments. Fabricated for rugged use. Designed for efficient tool and parts storage and built to a high standard.



"TT"—Transformer Trailer is one design of many for installation of transformer and circuit power. Transformer Trailers provide added capacity to restore service when secondary breakers trip repeatedly or transformers overload. This ingenious arrangement simplifies change-outs with fast service, anywhere.

"CPT"—Cargo Pole Trailers of many designs and capacities. Single, dual and four wheel trailers built to your specifications.

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(*Continued from page* 256)

sonnel problems. While the last part of the book gives guidance on the actual operation of the plant, it also touches on subjects such as buying fuel and evaluating water treatment systems.

The text is written lightly and is not substantiated by mathematical arguments. It is for management or engineers who aspire to management in the power plant end of the business.

Electrical Fundamentals

Basic Theory in Electrical Engineering. By Royce G. Kloeffler and Earl L. Sitz. Published by The Macmillan Co, 60 Fifth Ave, New York 11, N. Y. 334 pages, illustrated. Price $5.50

Good general coverage of electrical engineering fundamentals is contained in this book. It was written as an introductory text for engineering students majoring in electronics, communications or electric power.

The book deals with the basic theory of electric circuits; electric power and energy; conductors, semiconductors and insulators; magnetic circuits; ferromagnetic circuits; forces in magnetic fields; generated and induced voltages; electrostatics; voltage sources; and electrolysis and electromagnetic waves. Examples of problem solutions on each subject are included. Many unsolved problems are found at the end of each chapter.

Easy reading and good illustrations recommend this book highly for student engineers, for interested persons with a good foundation in physics, or for practicing engineers seeking to brush up on basic theory. Utilities should consider it as a text for engineering training courses.

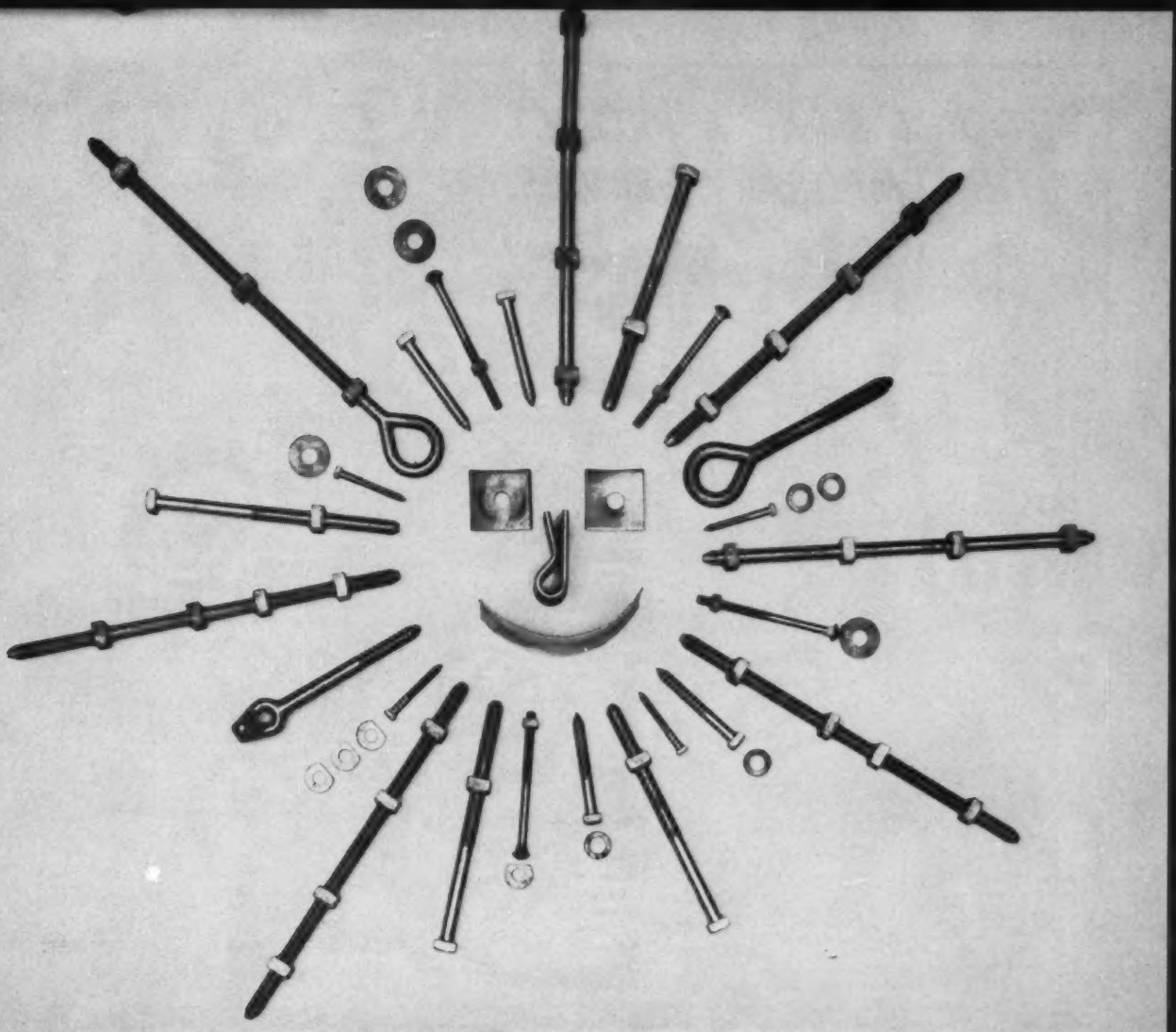
How to Start Equipment

The Commissioning of Electrical Plants and Associated Problems—3rd Edition. By R. C. H. Richardson. Published by Chapman & Hall Ltd, 37 Essex St., London WC 2, England. 440 pages, illustrated. Price 50 s.

This book discusses the practical aspects of putting major pieces of electrical equipment in service and presents recommendations for the common troubles sometimes encountered. Six major types of equipment are considered: generators (alternators), ac motors, transformers, direct current apparatus, rectifying plants, and circuit breakers. Each item is generally discussed in a standard pattern. First preliminary tests and other preparations prior to start-up are presented. These are followed by material on operation, possible sources of trouble, and their solution.

Use of the book requires not only a thorough technical background but also some practical experience in de-

(*Continued on page* 260)



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These commonplace items . . . bolts and nuts, screws and washers . . . are the backbone of Hubbard's more than 4,000 items of pole line hardware. Back of each is more than a century's manufacturing experience. In each is the strength and durability, the uniformly high quality that has made Hubbard the leader of pole line hardware for industry.

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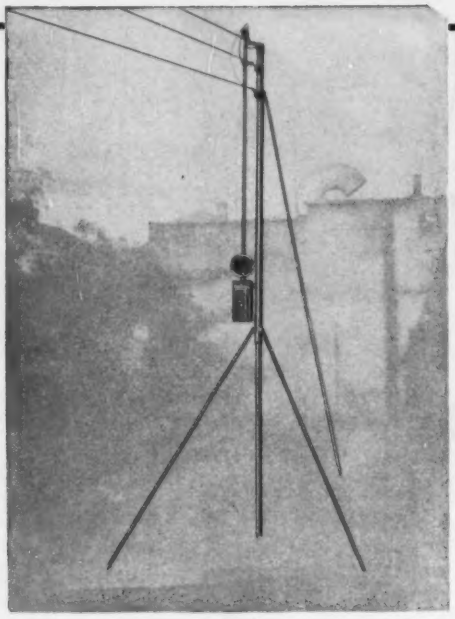

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1—Unit is self-contained and complete. Provides two 120 amp and one 220 amp outlet in rain-tight utility box.

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3—Can be installed by one man in minutes.

4—Useable over and over—simply drive new ground sleeve and re-install mast.

5—Easily removed, hauled or stored. Telescopes to eight feet.

● Illustration shows temporary all-steel service mast providing power to job site. Mast raises service wires 12 feet above ground level up to 18 ft. with extensions. Installation simple—(a) drive 3 ft. ground sleeve—(b) insert space pipe—(c) slide complete service unit into ground sleeve—(d) attach and secure steel braces.

Standard fittings include three heavy-duty insulators, entrance head, meter socket and rain-tight utility box equipped with padlock.

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Utility SERVICE COMPANY, INC.

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(*Continued from page* 258)

sign, operation, or maintenance. Although some of the terms are British, American engineers meeting the educational requirements should have no trouble using this book. British practices, problems, and solutions are quite similar to ours.

Engineers using the equipment mentioned can well use this book as a check on their start-up procedure, operational procedure, and trouble shooting program.

Power by Piping

Hydraulic and Pneumatic Operation of Machines. By H. C. Town. Published by Philosophical Library, 15 E. 40th St., New York 16, N. Y. 192 pages, illustrated. Price $7.50.

Presents practical material on the industrial application of pneumatic and hydraulic power. Emphasis is on use rather than theory. Text is well supplemented by sectional drawings and photographs of industrial equipment. However, most of this equipment is of British origin.

Book is divided into two parts: one part on hydraulics and the other on air compressors and their applications. Each section can be used independently of the other. The first section describes the advantages and limitations of oil for power transmission and shows the main types of pumps used. Also described are accumulator systems.

Air compressors, operation and maintenance of pneumatic tools and design of pneumatic circuits are the main topics of Part II.

Production engineers who depend on these types of power might find this book useful.

Engineering Definitions

Dictionary of Terms Used in the Theory and Practice of Mechanical Engineering—7th Edition. Originally compiled by J. G. Horner. 7th Edition revised and enlarged by Staton Abbey. Published by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. 417 pages. Price $6.50.

A comprehensive collection of definitions common to the mechanical engineering field, this seventh edition has attempted to strike a happy balance between terms associated primarily with Mechanical Engineering and those which, although not essentially mechanical, are closely related to this field because of the greater interdependence of the various engineering subdivisions today. Thus metallurgical, electrical, and electronic terms are included.

The dictionary is divided into two parts: modern terms, and general and traditional terms. Some of the terms are peculiarly British. The book is written especially for the technician rather than the experienced practicing engineer.

WORK CREWS HEAR MESSAGES
LOUD AND CLEAR

"big voice" Radio
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If you, or your dispatcher, have ever called a work crew and received no answer because compressors, ditchers and other noises drowned out the radio's message, or because all men were working too far from the truck to hear the call—you need Motorola's **"Big Voice"**.

High noise level is no problem when your trucks carry the new **"Big Voice"** 2-way radio system. The weatherproof loudspeaker, mounted outside the truck cab, shouts with *10 times* the normal audio power to carry your message clearly hundreds of feet away. And there's no more need to waste a man on stand-by duty at the truck.

A bonus feature permits the foreman to use the **"Big Voice"** as a public address system, using the standard "Big Voice" mike when he's in the cab and the optional "Handie-Micro-Talkie" cordless mike when remote from the truck. The **"Big Voice"** radio, audio, and P.A. booster fit compactly inside Motorola's standard mobile housing. The outside speaker can be muted for normal radio use, of course.

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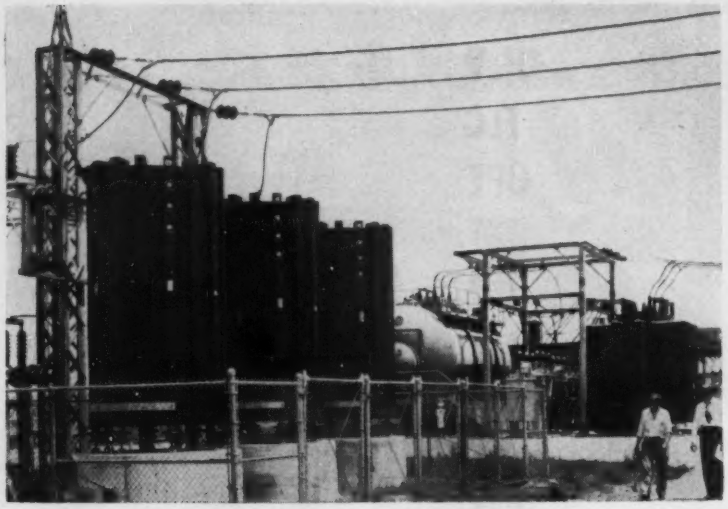


Detroit Adds GE Reactors, Condensers

Specially designed current-limiting reactors and synchronous condensers built by General Electric Co permitted addition of two large electric furnaces on the Detroit Edison system at Trenton, Mich.

The three reactors, each rated 12,500 kva, 6,920 v, 1,820 amp, are designed to give 50% reactive drop in a three-phase, 75,000-kva, 24-kv circuit. Windings are aluminum—standard on all GE current-limiting reactors since 1953.

The synchronous condenser (center background) helps control voltage on the steel mill line. It is one of two similar units which are rated 50,000 kva and operate at 600 rpm.

Electric Storage Battery Purchases Plastics Firm

Electric Storage Battery Co has purchased all capital stock of Jessall Plastics, Kensington, Conn., for an undisclosed amount. The acquired company is being operated as a wholly owned subsidiary of the Philadelphia, Pa., manufacturer.

Jessall, established in 1946, produces plastic extrusions and polyethylene tubes for Exide batteries.

A-C Offers Higher Ratings of Distribution Regulators

Six new higher ratings of single-phase distribution regulators were announced recently by Allis-Chalmers Manufacturing Co. They are designed to provide economies in distribution regulation which can be engineered into most utility systems.

Ratings of the new regulators are: 37.5 kva, 150 amp, 2.5 kv; 75 kva, 300 amp, 2.5 kv; 100 kva, 400 amp, 2.5 kv; 75 kva, 150 amp, 5.0 kv; 100 kva, 200 amp, 5.0 kv; and 167 kva, 219 amp, 7.62 kv.

The regulators are designed with Vari-Amp ratings to carry 160% rated load not to exceed 400 amp at ±5% regulation.

Joslyn Opens New Plant, Creates Gulf Division

South East-Joslyn Co, a Division of Joslyn Mfg and Supply Co, has formally opened its new plant addition and warehouse in Birmingham, Ala. The company is establishing an eight-state Division Headquarters at the same locality.

The new Gulf Division was created early this month to serve Florida, Georgia, South Carolina, Alabama, Mississippi, Louisiana, and parts of Arkansas and Tennessee. Branch sales offices and warehouses will be located in Atlanta, Jacksonville, New Orleans and Memphis.

J. E. Budden will be Gulf Division manager. Paul H. Robbins becomes assistant divisional manager and remains district sales manager. H. L. Geri will be manager of the Birmingham manufacturing plant.

Westinghouse Discloses New Transistor Process

A new technique for making transistors and other "solid state" devices from germanium has been developed at Westinghouse Research Laboratories, advises Dr Clarence Zener, acting director of Westinghouse research.

Dr Zener revealed two improved types of transistors have been made. They are: (1) A transistor capable of efficient operation at extremely high frequencies such as those encountered in television and other high-frequency electronic devices, and (2) a special resistor, called a photodiode, which is 10,000 times more sensitive to light than a conventional photoelectric cell or "electric eye," yet can control a hundred times more current.

BPA Reports Low Bids for Substation Additions

Bonneville Power Administration reported apparent low bids for additions to LaGrande and Roundup Substations, which would complete 230-kv interconnections with Idaho Power Co and the eastern group utilities of the Northwest Power Pool. Energization of the joint program, the investor-owned utility's lines now nearing completion and BPA's substations, is scheduled for May 1956.

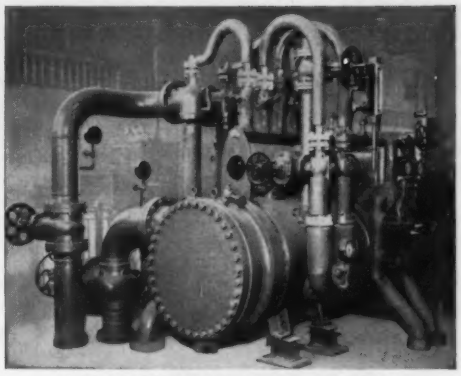
Brandon Co, Vancouver, Wash., with a $30,786 bid was low for LaGrande and $23,005 for Roundup.

Idaho Power has advised BPA it expects to have its lines between Baker and LaGrande and a 100,000-kva transformer installation at Baker ready for May, 1956.

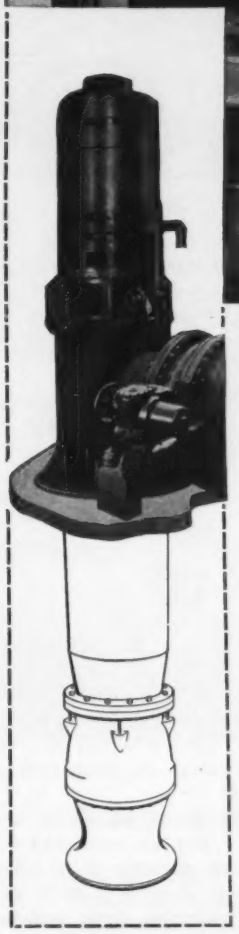
(*More M & M on page* 264)

"SELF-CLEANING" C. H. WHEELER PATENTED REVERSE FLOW STEAM CONDENSERS OPERATE ROUND-THE-CLOCK

THIS C. H. WHEELER PATENTED REVERSE FLOW SURFACE CONDENSER is a two pass, divided water box, dual bank design capable of condensing 440,000 lbs. per hour of exhaust steam. Condensing surface is 55,000 square feet.



C. H. WHEELER TUBEJET AIR PUMP consists of two 2-stage elements, mounted on surface type inter-after-condenser. Each 2-stage element is designed to handle 97.5 lbs. per hour air vapor mixture at 1 inch HG absolute.



C. H. WHEELER CIRCULATING PUMPS are 30" x 42" Vertical Mixed Flow, pull-out type. Capacity is 30,000 GPM each at a total head of 36.2 feet. Pumps are driven by 400 HP, 600 RPM synchronous speed vertical induction type motors.

New Deaerating Features Reduce Oxygen Content to Less Than 0.01 cc Per Liter

Progressive power companies are eliminating condenser shut downs and operation at reduced loads by installing C. H. Wheeler Patented Reverse Flow Steam Condensers.

One rapidly expanding utility has just put their fourth C. H. Wheeler Reverse Flow Condenser on the line. The latest unit, shown above, is not only "Self-Cleaning" but also has special new deaerating features that reduce the oxygen content of the condensate to less than 0.01 cc per liter. Continuous measurement by accurate recording instruments has proved that this low oxygen content is consistent over a wide range of load and temperature conditions.

Condenser circulating water used by this power company comes from a brackish river, laden with debris and leaves which clog steam condensers of regular design. "Self-Cleaning" C. H. Wheeler Patented Reverse Flow Condensers have solved their problem of how to avoid the expensive shut downs required to hand clean clogged tubes and tube sheets.

Debris is flushed away from the tubes and tube sheets simply by reversing the flow of cooling water through the condenser by means of hydraulically controlled built-in valves. Cleaning takes only a matter of minutes and can be accomplished under full load operating conditions with only a slight vacuum reduction. The power plant therefore can operate at full capacity round-the-clock.

Whatever your problems are . . . down time, deaeration, special operating conditions or requirements . . . let C. H. Wheeler help you solve them. Our engineering skill and experience can pay you high dividends in economy and efficiency.

Phone or write your local representative or our Philadelphia office for literature, information, or assistance.

WEB07

C. H. Wheeler OF PHILADELPHIA

C. H. WHEELER MANUFACTURING CO., 19TH & LEHIGH, PHILA. 32, PENNA.

STEAM CONDENSERS · CENTRIFUGAL, AXIAL AND MIXED FLOW PUMPS · STEAM JET EJECTORS · VACUUM REFRIGERATION · HIGH VACUUM PROCESS EQUIPMENT
MARINE CONDENSERS AND EJECTORS · MARINE PUMPS · DECK MACHINERY

Murco
GATE HOISTS!
for any Size Power Dam

Murray Gate Hoists are designed and built in a wide range of capacities —from less than one ton to over a hundred tons . . . from the smallest hand operated to the largest motor operated gate hoist.

In over 70 years of designing and building gate hoists we have developed many designs for the different types of gate hoist problems.

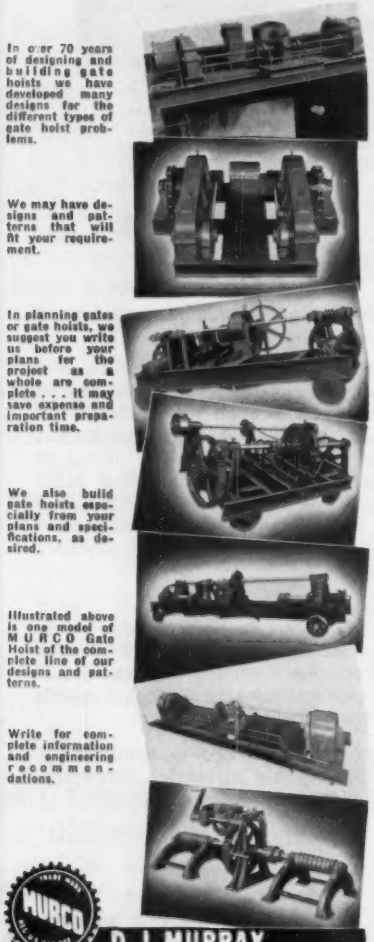
We may have designs and patterns that will fit your requirement.

In planning gates or gate hoists, we suggest you write us before your plans for the project as a whole are complete . . . it may save expense and important preparation time.

We also build gate hoists especially from your plans and specifications, as desired.

Illustrated above is one model of MURCO Gate Hoist of the complete line of our designs and patterns.

Write for complete information and engineering recommendations.



MURCO

D. J. MURRAY MANUFACTURING CO.

Manufacturers Since 1883

WAUSAU · WISCONSIN

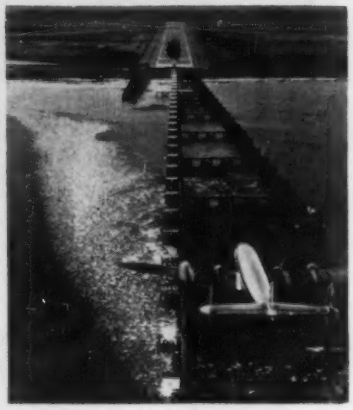
Sylvania Flash System Guides Aircraft

A new high-intensity lighting system to guide planes in landing during periods of limited visibility was installed recently by Sylvania Electric Products Inc at New York International Airport (Idlewild).

Developed by Sylvania engineers, the system consists of 20 Strobeacon units in a single 2,000-ft row in the approach path leading to the runway. Each unit employs a high-intensity xenon flash tube which produces a beam of over 30-million cp.

Each tube flashes twice every second. The units flash in sequence toward the runway, giving the effect of an animated arrow pointing at the runway. The short duration of the flash, normally 200 microsec, does not permit retention by human eyes and consequently does not glare or blind.

The electronic flash approach system (known as EFAS) broadens the all-weather applications of the airport's existing airport lighting system. It is expected to reduce flight delays, cancellations, and control problems.



Revere Produces Inflatable Tube in Strip

A single strip or sheet of solid copper, brass or aluminum in which tubes are inflated is a mill product recently developed by Revere Copper & Brass, Inc.

This "Tube-in-Strip" is said to have immediate applications in refrigeration and air conditioning, radiant panel heating, water heaters and coolers, chemical and food processing, and other heat-exchange fields.

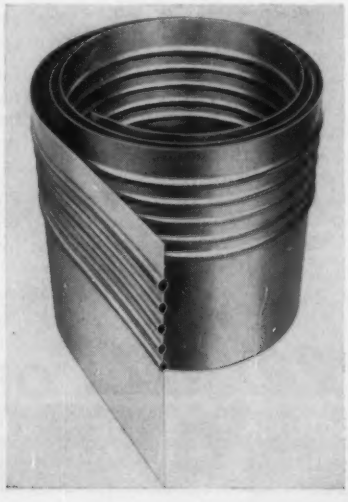
Richard A. Wilkins, vice president of Revere's Research and Development Department, said: "Except for the expandable portions, the metal is a solid strip of metal derived from a suitably treated casting and does not consist of two pieces of metal brazed, welded and rolled together."

"The metal can be stamped or drawn into desired shapes prior to the expansion of the channels," stated Wilkins. "It is also possible to inflate channels on one side of the strip or sheet only, leaving the other surface flat," he said.

Inflation techniques include air, gas or hydraulic, and are performed by the user. Inside diameters of the tubes can vary from about 3/16 to ⅝ in. inclusive. Illustration shows sections of strip expanded to tubes.

Shipment of Tube-in-Strip is ordinarily in uninflated form making possible substantial shipping economies.

Prices for the new product, according to Revere, call for a nominal mark-up over the catalog trade price list of sheet, roll or strip of corresponding width, gauge and length in copper, brass or aluminum. At these prices, Revere claims, the user saves in cost by buying tube and strip together already fabricated to his design, rather than separately.



(*More M & M on page* 266)

P&K ALL-ALUMINUM STANDARDS AND ARMS:

ROOSEVELT BOULEVARD, PHILADELPHIA, WHERE 1,000 NEW LIGHTS ON P & K ALL-ALUMINUM STANDARDS AND ARMS WILL MARK THE LAUNCHING OF PERHAPS THE MOST FAR-SIGHTED STREET LIGHTING PROGRAM OF ALL TIME.

AT THE END OF A 10 YEAR PROGRAM 70,000 STREET LIGHTS WILL HAVE BEEN INSTALLED AND MODERNIZED. ALL POLES, BRACKETS AND LUMINAIRES BEING USED ARE ALUMINUM.

MR. HAROLD E. MASON
Street Lighting Engineer
City of Philadelphia

THE LOGICAL CHOICE IN PHILADELPHIA

Like their 500 P & K predecessors installed in the "World's Workshop" years ago, these new P & K 32-ft. All-Aluminum Standards, and P & K 12-ft. Tapered Elliptical Arms will prove *the wisest investment in modern lighting.*

LIGHT-WEIGHT, HIGH STRENGTH, AND CORROSION-FREE FOR EASY INSTALLATION AND LONGEST LIFE.

NO NEED FOR PROTECTIVE MAINTENANCE, NEVER NEED PAINTING.

NO SEAMS, NO FRILLS, NO SCROLLS, NO TIE-RODS. ITS MODERN SIMPLICITY IS CONTEMPORARY TODAY OR TWENTY YEARS FROM TODAY.

PROVES MUCH LOWER IN COST OVER THE YEARS.

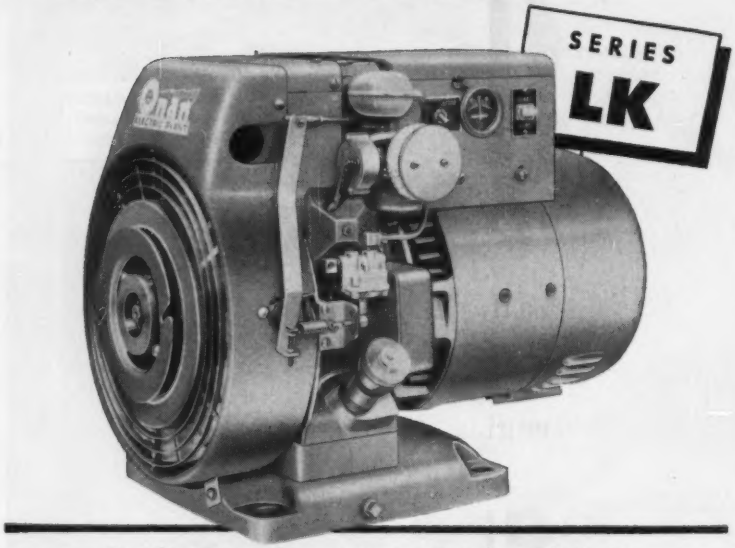
Write for latest P & K catalog . . . and use the P & K advisory and planning services without obligation.

Pfaff & Kendall
84 Foundry Street
Newark 5, New Jersey

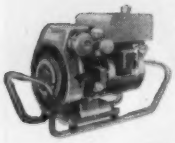
RUGGED

is the word for this

New ONAN 2-KW Electric Plant

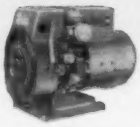


Put it to work on your toughest jobs!



PORTABLE POWER

Stands up better under rough handling. Carrying -frame or 2-wheel dolly optional.



PRIMARY POWER

Runs longer in continuous day-after-day service. Dependable, economical.

A dependable source of electricity for emergency standby use

Built to do the job where other units won't stand up! This new 2,000-watt, A.C., 115 or 230-volt, gasoline-driven Onan plant can take all kinds of punishment and come back for more. It's powered by a husky, Onan 4-cycle, single-cylinder, engine with Stellite-faced rotating exhaust valve, larger longer-wearing bearings, and efficient, trouble-free air-cooling. The Onan-built generator is direct-connected, permanently aligned, and fully-protected for use under all climatic conditions.

The Onan "LK" is compact too . . . requiring less than 3 square feet of floor space. Heavy-duty construction throughout . . . yet it weighs only 235 pounds. In carrying frame or dolly-mounted it can be taken anywhere and is easily moved around on the job.

The rating of 2,000 watts is conservative, allowing ample overload. Fuel consumption at full rated load is less than one quart of gasoline per kilowatt hour, making the "LK" a low-cost source of primary power. Recoil rope starter on models for portable use; electric starting available for stationary installations; automatic controls for emergency standby use.

Wide range of accessories available

Write today for special "LK" folder!

Onan ELECTRIC PLANTS

D. W. ONAN & SONS INC.

2936 UNIVERSITY AVE. S.E. • MINNEAPOLIS 14, MINNESOTA

M&M BRIEFS

Tait Manufacturing Co is the new name for Dayton Pump & Manufacturing Co. The name was changed recently in honor of Frank M. Tait, board chairman and founder of the firm. He is also chairman of Dayton Power & Light Co.

Royal Precision Corp was formed recently by Royal McBee Corp and General Precision Equipment Corp. The jointly owned subsidiary will use facilities of both parent companies to develop, produce and market electronic data processing and computation machines and accessory equipment.

Warner Electric Brake & Clutch Co will build a $1-million, 100,000-sq ft plant on a 64-acre site near Beloit, Ill. The factory, slated for completion in mid-1956, will turn out automotive products, including small wheel brakes, air-conditioning clutches, and electric fan clutches.

Edward Valves, Inc, a subsidiary of Rockwell Manufacturing Co, is doubling the size of its Research Laboratory at East Chicago, Ill. A section will be devoted to development, assembly and final testing of valves for nuclear power service. The addition is expected to be completed in the spring.

American Silver Co, 36-07 Prince St, Flushing, N. Y., reports that it has a thermostat bimetal (ASC-1) with a deflection range of 100-700 F. The product is used in circuit breakers, fluorescent fixtures, room thermostats, and automobile chokes.

Ottawa Steel Division of L. A. Young Spring & Wire Corp, Ottawa, Kansas, recently purchased assets of Tracto-Lift Co, Kansas City, Mo. Principal Tracto-Lift product is a heavy-duty fork lift truck that moves bulky materials over rough terrain.

Dayton Rubber Co recently put a plant into operation at Atlanta, Ga. The new operation, known as Holfast Division, will turn out industrial tapes, and natural and synthetic rollers.

Bogue Electric of Canada, Ltd, recently opened administrative and production headquarters in a new plant at

(*More M&M Briefs on page* 268)

malleable iron

is the one available *low cost link* by which material strength and corrosion resistance can join designing and engineering to give

pole hardware

Longer Life

MIF *longer life* pole hardware costs no more, and often less, than carbon steels — and far less than special, non-corrosive, premium priced steels.

MALLEABLE IRON FITTINGS COMPANY
Pole Hardware Division **Branford, Connecticut**
N. Y. Office: 30 Church St.

Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. JSG Electric Co., Chicago, Ill., Lee-Smith Co., Miami, Fla. • B. H. McColn, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla., E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich.

PAGE chain link FENCE

America's First Wire Fence—since 1883

• When next you need fence as protection against common hazards you certainly will want time-tested quality in the safeguard you provide. Whether you choose heavily galvanized Copper-Bearing Steel, corrosion-resisting Aluminum, or long-lasting Stainless Steel, PAGE Fence is quality controlled from raw metal to rugged fence erected on metal posts deep-set in concrete. Available are 8 basic styles, varied by heights, types of gates, top rails, and barbed wire strands for added security. Finally, your PAGE Fence will be expertly erected by a reliable, technically trained firm. For important fence data and name of nearest PAGE firm—

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

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PORTABLE FIELD EQUIPMENT FOR ELECTRICAL DISTRIBUTION SYSTEMS

All new units with these most important features: • Portable • Rugged • Weather Proof • Field Tested for over a year by one of the east coast's largest gas and electric companies.

- **MECHANISM TEST SET MODEL C-13** provides tests for the motor mechanism, desensitizing relay, and circuit breaker in General Electric or Westinghouse Network Protectors.
- **PHASING TRANSMITTER MODEL E C-25** provides low voltage system for tracing individual wires in shielded cable and for determining correct phase.
- **POLATROL RELAY TEST SET MODEL C-109** provides adjustable voltage for testing all DC Polatrol Relays used in street lighting systems.
- **VOLTAGE QUADRUPLE SERIES TEST SET** provides high voltage test for series street lighting systems. Permits check at any time, day or night, and at any location.

RELAY TEST SET MODEL C-13 provides quick, easy method for testing and adjusting the master relay in either General Electric or Westinghouse NETWORK PROTECTORS. Also for testing the current transformers.

Gentlemen: Please send me a catalogue on your Electrical Distribution Equipment.

Name.....

Title.....

Company.....

Address.....

El Mec Laboratories invites your inquiries on any special test equipment. We have the engineers and facilities to design and build to meet YOUR REQUIREMENTS.

el mec LABORATORIES, INC.

730 Boulevard, Kenilworth, N. J. • CHestnut 1-0044

(*Continued from page* 266)

Gloucester, near Ottawa, Ontario. The new plant will produce motors, generators, power supplies, control systems and electronic components.

Siegler Corp of Chicago and Long Beach, Calif., manufacturer of space-heating equipment, recently acquired Holly Manufacturing Co, Pasadena, Calif., producer of wall-type heaters and central heating equipment.

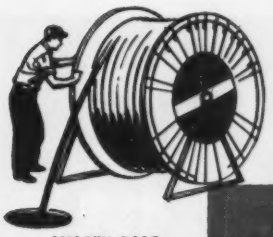
Balfor Industries, Inc, a newly organized company with offices and plant at 1815 Webster Ave, Bronx 57, N. Y., is now in production in all phases of Teflon processing. Products include all Teflon basic shapes such as rod, tube, sheet, slab, and mechanical and electrical grade Teflon tape.

Motorola Inc has relocated the Microwave and Industrial Products Dept in a modern one-story structure at 1400 N. Cicero Ave, Chicago 15, Ill. Expanded facilities — office, laboratory, engineering and manufacutring quarters — are for microwave systems, supervisory control and power line carrier equipment.

Federal Telephone and Radio Co, Clifton, N. J., is conducting a campaign to assure continued availability of high-purity selenium. R. S. Perry, F. T. R. president, advises that steps are being taken to reclaim the material by paying its customers for used selenium rectifiers returned for salvage. Scarcity of selenium is reported due to expanding use of the metal in power rectifiers, plus copper-mining work-stoppages in the past year.

Trenton Plastics Laboratories, Trenton, N. J., has been formed to produce custom formulated epoxy and modified epoxy resin compounds for the electrical industry. These systems are used for potting, encapsulating, impregnating and casting applications of many electrical components.

Automatic Electric Co, Chicago, Ill., recently announced plans to build a 1.3-million-sq ft factory, research laboratory and general office building on a 170-acre site in Northlake, Ill. The $16-million facility is slated for completion by late 1957. The company makes telephones, dial-switching equipment and other telephone apparatus.



SMOOTH BORE
NO SCORING OR
ABRASION OF SHEATH

EASY TO
INSTALL

EASY TO TOOL

The Happy Combination

CUTS WITH SAW

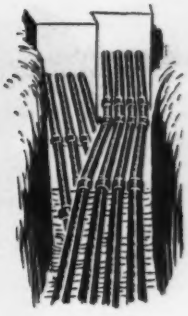
LIGHT - EASY
TO HANDLE

Complete Protection... Long Life...Low Cost

ORANGEBURG
NOCRETE

COMPLETE LINE OF
INTERLOCKING PLASTIC SPACERS

WATER TIGHT JOINTS



ORANGEBURG
STANDARD

HOW does Orangeburg give cables complete protection? It's tough and strong. It's resilient, and "gives" without cracking or breaking. Its walls are impermeable. Its non-metallic material resists acids, alkalies, oil and salt in ground waters. Its joints are watertight. Its smooth bore reduces danger of abrasion.

WHY such low cost? Because Orangeburg is lightweight and easy to install; it lays faster than any other type of conduit... saves time and money. The long 8-foot lengths mean fewer joints to make. The Taper Sleeve Joints seal watertight with a few light taps. It lasts indefinitely... gives years and years of economical service.

ORANGEBURG IS A LEADER IN EVERY CITY AND STATE
WRITE TO DEPT. E.W. 16, FOR NEW 12 PAGE CATALOG NO. 52

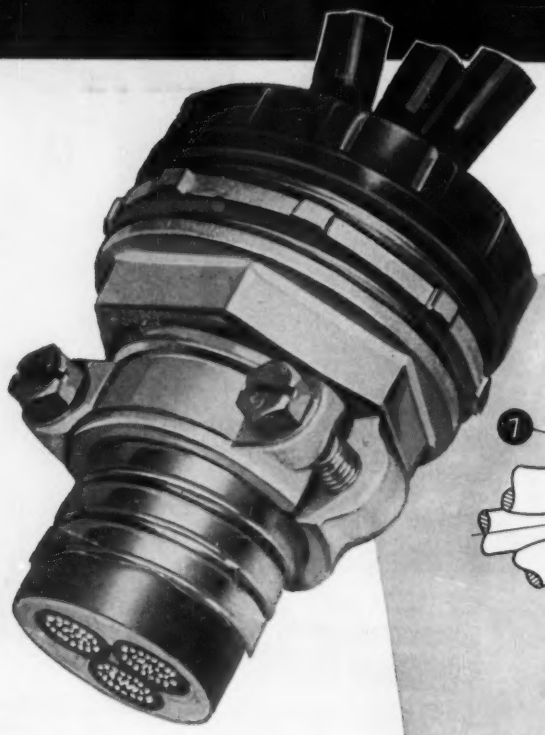
ORANGEBURG MANUFACTURING CO., INC., ORANGEBURG, N. Y. • West Coast Plant: NEWARK, CALIF.

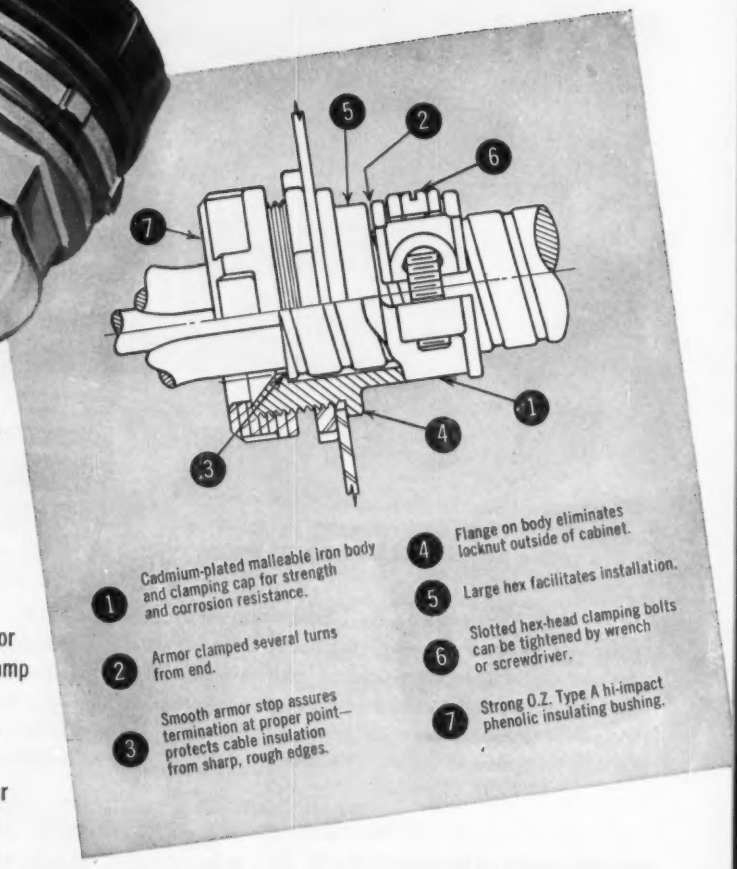
ORANGEBURG® FIBRE CONDUIT

ORANGEBURG FIBRE CONDUIT IS DISTRIBUTED BY GRAYBAR ELECTRIC COMPANY AND GENERAL ELECTRIC SUPPLY COMPANY • BRANCHES AND STOCKS IN PRINCIPAL CITIES

from every angle–

O.Z. TYPE "PK" is the clamp





1. Cadmium-plated malleable iron body and clamping cap for strength and corrosion resistance.
2. Armor clamped several turns from end.
3. Smooth armor stop assures termination at proper point—protects cable insulation from sharp, rough edges.
4. Flange on body eliminates locknut outside of cabinet.
5. Large hex facilitates installation.
6. Slotted hex-head clamping bolts can be tightened by wrench or screwdriver.
7. Strong O.Z. Type A hi-impact phenolic insulating bushing.

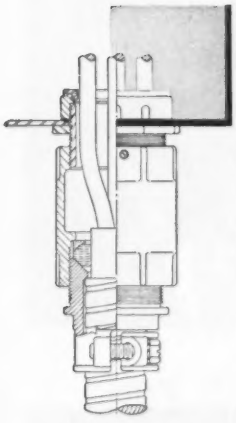
Here is a clamp designed specifically to meet the requirements of interlocked armor cable applications. The O.Z. Type "PK" Clamp provides exceptional speed and ease of installation, whether your cable enters the cabinet from the top, bottom or side. It is designed with ample thread length for use with all standard conduit fittings and terminators from 1" to 5" and is available for interlocked armor cable ranging in size from .99" to 4.38" O.D.

Call your local O.Z. Distributor.

for ARMORED CABLE

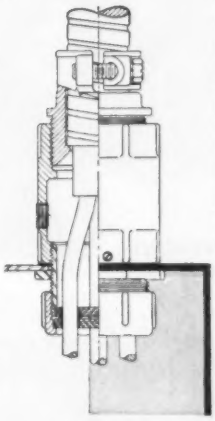
combines with standard O.Z. fittings for any terminating or splicing job involving INTERLOCKED ARMOR CABLE.

Seals cable ends to protect insulation against moisture and other contaminators—can also be used with threaded hubs and bosses to provide watertight cable entrances.



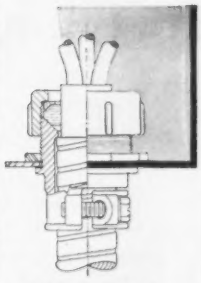
TYPE "PKC"

Terminator for interlocked armor cable entering bottom of cabinet.



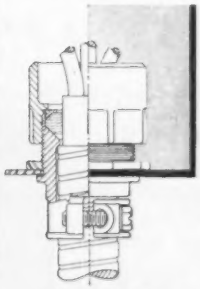
TYPE "PKT"

Terminator for interlocked armor cable entering top of cabinet.



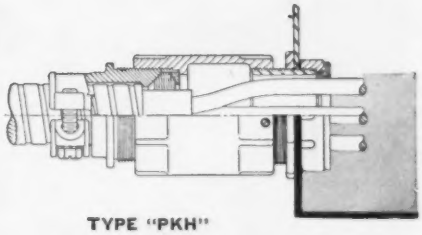
TYPE "PKG"

Sealing bushing for interlocked armor cable entering a cabinet.



TYPE "PKF"

Compound bushing for interlocked armor cable entering bottom of cabinet.



TYPE "PKH"

Terminator for interlocked armor cable entering side of cabinet.

TYPE "PKS-J"

Splicing chamber for interlocked armor cable.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

CAST IRON BOXES
CABLE TERMINATORS
POWER CONNECTORS
SOLDERLESS CONNECTORS
GROUNDING DEVICES
CONDUIT FITTINGS

Neal to Head Fitchburg G&E

Albert G. Neal has been elected president of Fitchburg (Mass.) Gas & Electric Light Co. Neal, vice president and general manager since 1949 and a director since 1951, succeeds Frank S. Clifford who is retiring as president, but remaining as director, after 53 years of service with the company.

Neal came to Fitchburg G&E in 1914 as office manager. He was named assistant manager in 1919 and promoted to manager in 1927. In 1948 he was appointed a vice president of the company.

Prior to his Fitchburg career he was associated with Boston & Maine Railroad from 1904 to 1909, when he joined Suburban Gas & Electric Co as an accountant.

A. G. NEAL

NAWB Elects Bremicker

New chairman of the National Adequate Wiring Bureau's executive committee is C. T. Bremicker, vice president of sales for Northern States Power Co. He replaces retiring chairman C. C. Walker, commercial vice president of General Electric Co.

Bremicker represents Edison Electric Institute on the executive committee which includes representatives from various electrical trade associations. Other organizations in the group are National Electrical Manufacturers Association, National Electrical Contractors Association, National Association of Electrical Distributors, and the International Association of Electrical Leagues.

The new NAWB chairman is also chairman of the executive committee of North Central Electrical League, and is a member of the executive committee, Commercial Division, of EEI.

C. T. BREMICKER

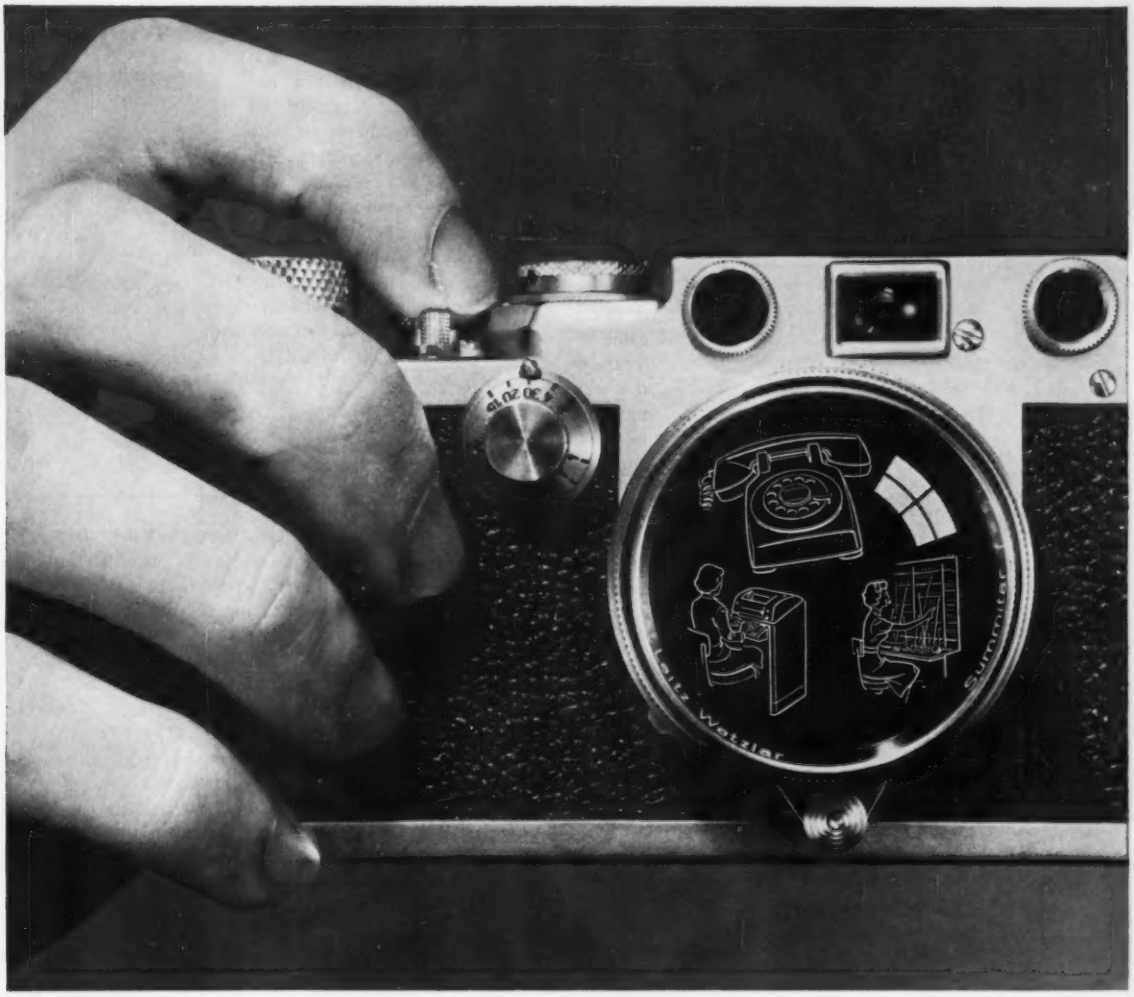
A-C Promotes 2 VP's

Allis-Chalmers Manufacturing Co has announced the appointments of Willis G. Scholl as executive vice president, and of Boyd S. Oberlink as vice president in charge of the tractor group.

Scholl, formerly a group vice president, succeeds R. S. Stevenson, who was elected president in April, 1955. Scholl joined A-C in 1936 as a salesman in Columbus, Ohio, and later served as assistant branch manager and manager at Toledo. From 1947 to 1951 he was eastern territory manager of the tractor division's sales force. He then became sales manager, tractor division, and in 1952 was appointed vice president of that division, which was reorganized into the tractor group in 1955. He was elected to the board of directors in 1953.

Oberlink, who succeeds Scholl as group executive, has served as vice president and general manager of the construction machinery division since last year. He has been with A-C's tractor division since 1934. In 1943 he was appointed assistant industrial sales manager and three years later assistant to the vice president in charge of the tractor division. He was named vice president in charge of the tractor division in 1951.

W. G. SCHOLL B. S. OBERLINK



Do you have a good picture of what Bell System communications can do for you?

Looked at your communications recently? You might be surprised at what has happened as your business has grown—the wrong type of equipment here, not enough of the right kind there.

To make sure your communications are doing a good job for you, why not let the Bell System review them? The result can mean substantial savings in time and money to you, faster and better service for your customers.

Bell System recommendations are "custom-built" for your particular communication requirements. This is important since no two companies, even in the same industry, do business exactly alike. They differ in size, territory and methods of operation.

•

The Bell System will give you a clear picture of your communications and recommend services for your specific needs. There's no cost or obligation—just call your Bell Telephone representative.

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER MOBILE RADIO TELEMETERING AND REMOTE CONTROL CHANNELS

Walter Kidde Ups Shannon

G. T. SHANNON

Walter Kidde Constructors, Inc, has elected Gerard T. Shannon vice president of Walter Kidde Engineers Southwest, Inc, a division of the parent company with headquarters in Houston. He will continue as general manager of Walter Kidde Constructors' southwest office.

Shannon joined the company in 1953 as managing engineer for the industrial engineering department.

L-M Names Sales Manager

Line Material Co has announced the appointment of Wilson M. Dusenberry as sales manager for the company. He succeeds Earle W. Williams who was recently promoted to vice president of marketing and sales.

Dusenberry joined L-M in 1944 as field engineer, serving in the Mountain States Division. He was promoted to his most recent position of Southwest Division manager in 1950.

W. M. DUSENBERRY

PERSONAL BRIEFS

Chris H. Kraft has been appointed assistant vice president of production and distribution for Union Electric Co of Missouri. He is succeeded as superintendent of transmission and distribution by **William M. Penney,** formerly superintendent of distribution. As assistant vice president, Kraft will act as an advisor and consultant in major problems of engineering and organization development, mainly in transmission and distribution activities of the system.

California Electric Power Co has designated **Borneo Stoker** secretary of the utility. He succeeds **John R. Gilbert,** secretary since 1935, who continues as a director, vice president, and treasurer.

Delaware Power & Light Co has appointed **Charles F. Parcels** as general superintendent of electric production, and **Kaare Rise** as superintendent of the company's Edge Moor Power Station. Parcels has held the latter post since he joined the company in 1948, and Rise was formerly assistant superintendent at the power station.

American Gas & Electric Service Corp has named **Frank G. Nagele** purchasing consultant. He will continue as vice president of the Service corporation and will direct a program of research in the field of purchasing and warehousing.

J. M. Stedman, general sales manager for Pennsylvania Power & Light Co, has been named business development manager to head the newly formed business development department. **J. H. Jacobs** has been named assistant manager. Heading the five new groups within the department are: **H. H. Brenan,** director of market development group; **W. E. Cameron,** residential sales; **J. S. Hanckel,** business sales; **R. T. Jones,** agricultural development; and **D. L. Diehl,** who continues to direct area development activities.

Rex Lee, engineer in Beaumont for Gulf States Utilities Co, has been transferred to Baton Rouge as operating superintendent of the company's electrical department for the Baton Rouge Division. He succeeds **L. M. Welch,** who has been named Beaumont Division manager.

James E. Sugden has been appointed business development activities manager for Pennsylvania Power & Light Co's Schuykill Division. Sugden, former division sales manager at Wilkes-Barre, has been with the utility since 1927.

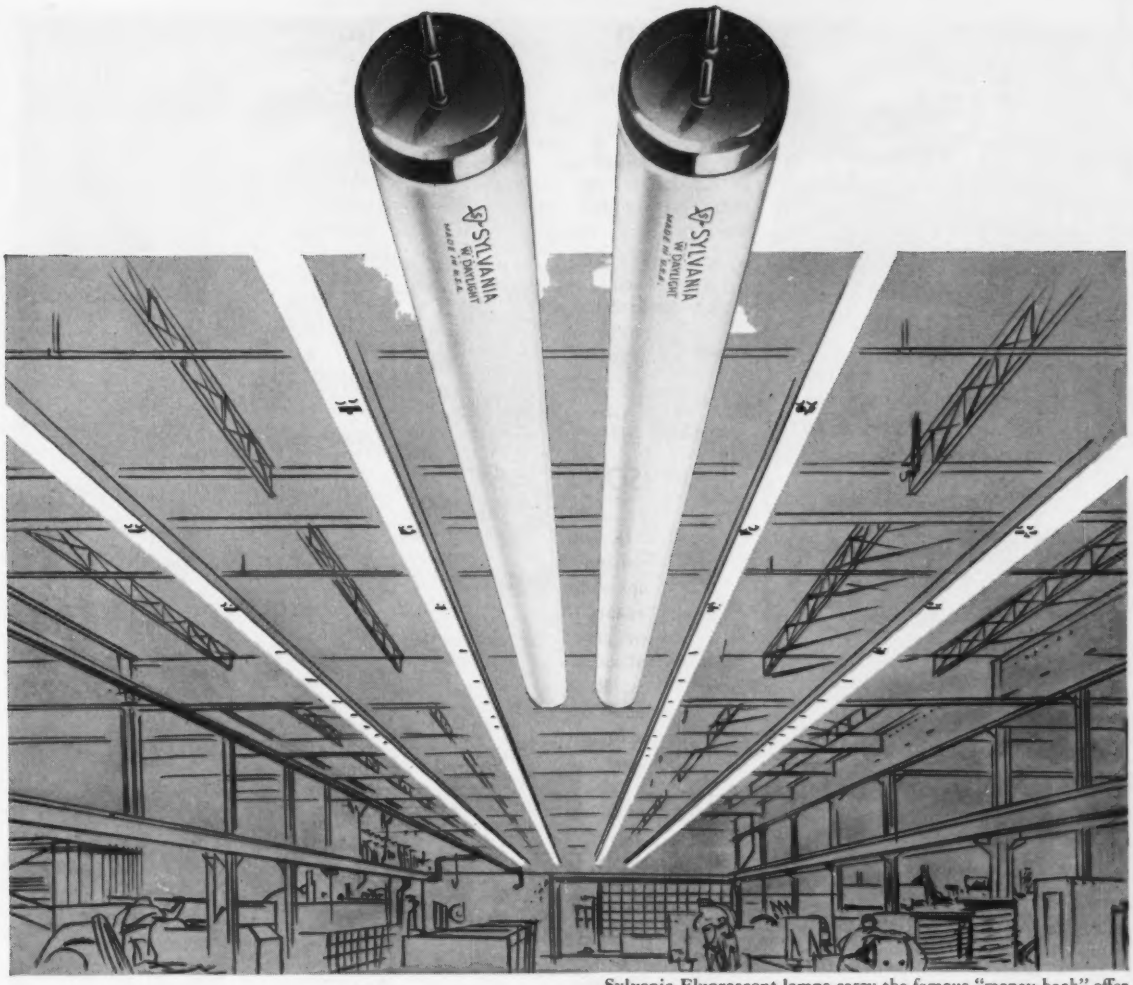
General Electric Co has made the following recent appointments: **Karl R. Van Tassel** has been named manager of the newly established Atomic Products Study in GE's Atomic Products Division. Succeeding him as general manager of the Knolls Atomic Power Laboratory is **Frederick E. Crever** . . . **Lemuel R. Boulware,** vice president, has been named head of GE's newly organized public and employee relation services. The new section is result of a merger of public relations services and employees and plant community relations services . . . Five recently appointed section managers for the company's medium transformer department are **Theodore F. Volkmer,** engineering; **David Hopley,** manufacturing; **Christopher T. Kastner,** marketing; **Wilbur A. Bethel,** finance; and **George D. Austin,** employee and plant community relations.

Allan E. Jones has been promoted from deputy manager to general manager of the U. S. Atomic Energy Commission's Grand Junction, Colo., operations office, succeeding **Sheldon P. Wimpfen** on Feb. 1.

OBITUARY

Oswald E. Asplundh, 65, vice president of Asplundh Tree Expert Co, died recently. He was one of the founders and a director of the company, and until his retirement several months ago, served as regional manager of midwestern and southwestern operations.

John B. Poston, 67, president and board chairman of Columbus & Southern Ohio Electric Co, died recently in Mt. Carmel Hospital, Columbus, after a long illness. Poston was a former vice president and general manager of Southern Ohio Electric Co, and also served as executive vice president of Columbus Railway Power & Light Co. He was elected Southern Ohio president in 1934, and in 1937, when the two firms merged to form the Columbus & Southern Ohio Electric Co, he continued as executive vice president until his 1942 appointment as president.



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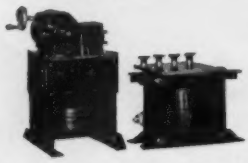
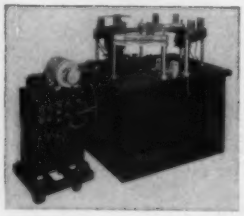
. . . offer smooth adjustment of current from 0 to full capacity of the table.



1200 Ampere Capacity



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SALES ASSIGNMENTS

COMPANY STAFFS

Asplundh Tree Expert Co has named Harry Ertel to head the company's operations in Georgia and northern Florida, in addition to his duties as regional manager for North Carolina and South Carolina. C. E. Weimer, regional manager for Indiana, Kentucky, Tennessee, Alabama, Mississippi, and Louisiana has transferred his headquarters from Atlanta to Louisville, Ky.

Bristol Co has designated Reginald H. Rose and L. Robert Steele socket screw field representatives for the company. Rose will cover the Boston area, and Steele has been assigned the territories of northern California, Oregon, and Washington, with offices in San Francisco.

Graybar Electric Co has named John Reine, assistant district manager at Chicago for the past year, as Chicago district manager.

G&W Electric Specialty Co has appointed M. L. Kirchmayer as representative for eastern Wisconsin and the northern peninsula of Michigan.

I-T-E Circuit Breaker Co has announced the appointment of Merlin J. Adams as Chicago district manager.

John A. Roebling's Sons Corp's Electrical Wire & Cable Division has assigned Thomas A. Martino the territory of southeastern Michigan, with headquarters in Detroit.

Sylvania Electric Products, Inc has promoted Noel C. Bride to district lighting sales manager of the Washington, D. C. district, with headquarters in Alexandria, Va. Bride is former assistant district sales manager of the area, and succeeds G. Dallas Rand, who was recently named manager of government lighting sales by Sylvania.

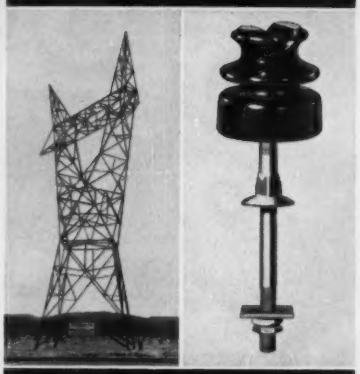
Westinghouse Electric Corp's Electric Appliance Division has designated Robert L. Allen as portable appliance manager for the Pacific Northwest district. Before his present appointment he served as portable appliance district manager serving the Montana, Idaho, and Utah markets.

REPRESENTATIVES

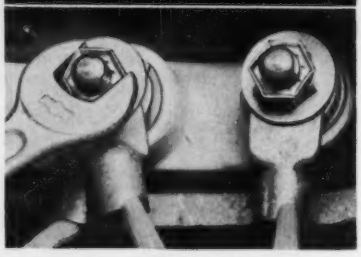
Fisher-Pierce Co, Inc, will be represented in Minnesota, North Dakota, South Dakota, and portions of Iowa and Wisconsin by the Dolan-Felhaus Co of Minneapolis.

Automatic Switch Co has made the following new appointments of representatives: Equipment Sales Co will cover the Ohio area; Pierre Lenmark Co will handle sections of Iowa and Illinois; and Washburn-Garfield Co has been named to represent the company in the Massachusetts area.

Assemblies stay tight!



Connections stay tight!



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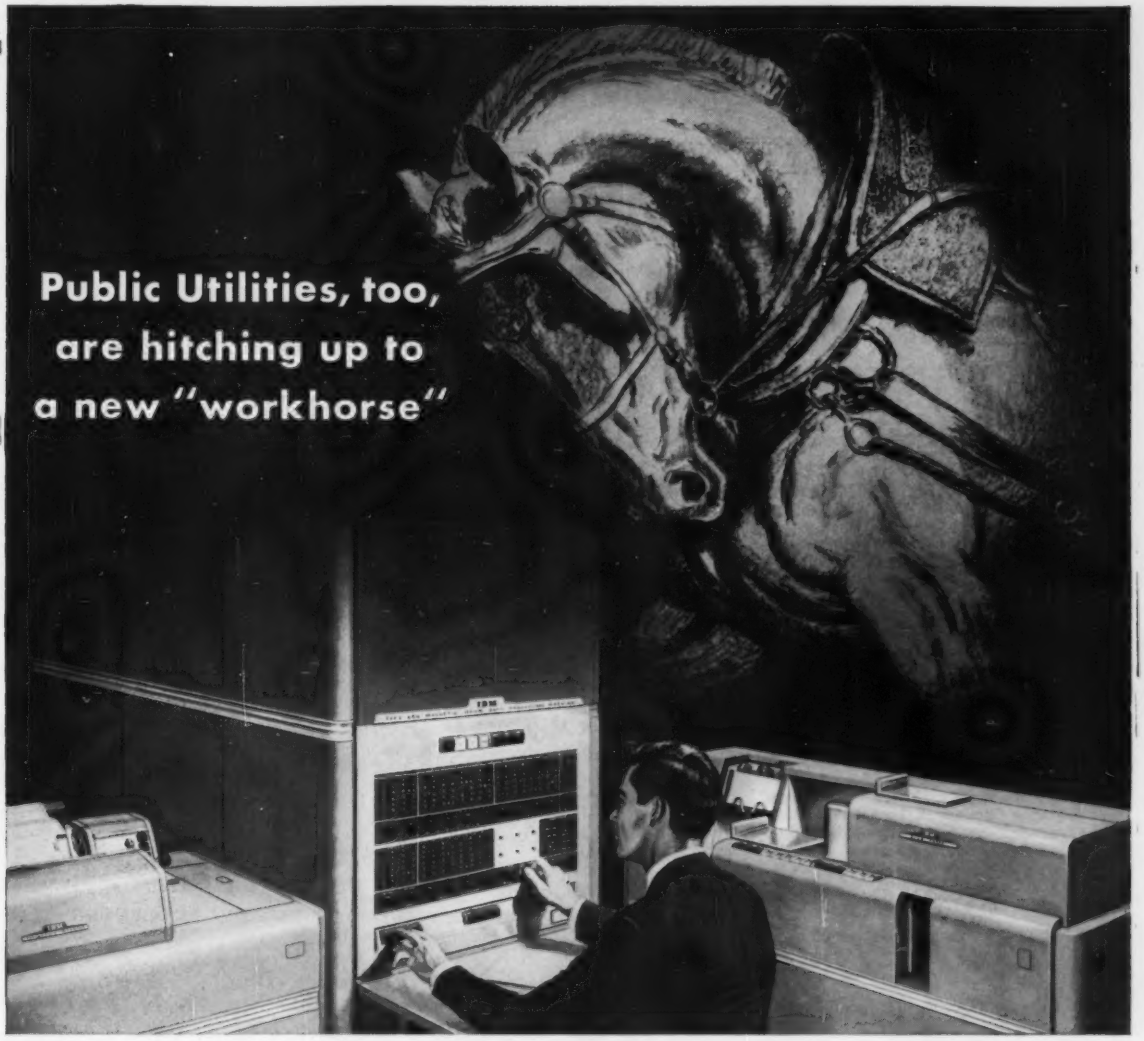

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MEETINGS CALENDAR

JANUARY

AMERICAN SOCIETY HEATING & AIR CONDITIONING ENGINEERS—Annual Meeting, Sheraton-Gibson Hotel, Cincinnati, Ohio, Jan. 23-25.

NATIONAL RURAL ELECTRIC COOPERATIVE—14th Annual Meeting, St. Louis, Mo., Jan. 23-26.

DOBLE ENGINEERING CO—23rd Annual Conference of Doble Clients, Sheraton Plaza Hotel, Boston, Mass., Jan. 23-27.

AMERICAN MANAGEMENT ASSOCIATION—General Management Conference, Fairmount Hotel, San Francisco, California, Jan. 24-27.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION—8th Annual College-Industry Conference, Marquette University, Milwaukee, Jan. 26.

ENGINEERS JOINT COUNCIL—General Assembly, Hotel Statler, New York, Jan. 26-27.

ELECTRICAL EQUIPMENT REPRESENTATIVES ASSOCIATION—Annual Meeting, Edgewater Beach Hotel, Chicago, Ill., Jan. 26-28.

***EDISON ELECTRIC INSTITUTE**—Prime Movers Committee, Warwick Hotel, Philadelphia, Pa., Jan. 30-Feb. 1.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Winter General Meeting, Hotel Statler, New York, Jan. 30-Feb. 3.

FEBRUARY

EDISON ELECTRIC INSTITUTE—Conference Planning, sponsored jointly with AGA, William Penn Hotel, Pittsburgh, Pa., Feb. 2-3; Commercial Electric Space & Air Conditioning Committee, Atlanta, Feb. 6-7; Industrial Power & Heating Group, Netherland Plaza Hotel, Cincinnati, Feb. 7-8; Transmission & Distribution Committee, Warwick Hotel, Philadelphia, Pa., Feb. 7-8; Electrical Equipment Committee, Homestead, Hot Springs, Va., Feb. 13-14; Commercial Lighting Committee, Hotel Shoreham, Washington, D. C., Feb. 15-16; Residential Promotion Committee, New York, Feb. 16-17; Commercial Cooking & Water Heating Committee, The Atlantic-Biltmore Hotel, Atlanta, Feb. 16-17; Meter & Service Committee, Hotel Cleveland, Cleveland, Ohio, Feb. 20-22.

GREAT LAKES POWER CLUB—LaSalle Hotel, Chicago, Illinois, Feb. 2-3.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Industrial & Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 2-3.

***PENNSYLVANIA ELECTRIC ASSOCIATION**—Transmission & Distribution Committee, Benjamin Franklin Hotel, Philadelphia, Pa., Feb. 2-3. Relay Committee, Benjamin Franklin Hotel, Philadelphia, Pa., Feb. 9-10; Electrical Equipment Committee, Penn Harris Hotel, Harrisburg, Pa., Feb. 9-10; Communications Committee (Winter Meeting), Adelphia Hotel, Philadelphia, Pa., Feb. 13-14; Systems Operation Committee, Hotel Statler, New York, Feb. 16-17; System Planning Committee (Winter Meeting), Hotel Roosevelt, Pittsburgh, Pa., Feb. 20-21.

INDUSTRIAL ELECTRIFICATION COUNCIL—National Industrial Electric Heating Conference, Netherland Plaza Hotel, Cincinnati, Ohio, Feb. 6-10.

SOUTHEASTERN ELECTRIC EXCHANGE—Personnel Administration Section, Buena Vista Hotel, Biloxi, Miss., Feb. 9-10.

***AMERICAN SOCIETY OF CIVIL ENGINEERS**—National Winter Convention, Dallas, Tex., Feb. 13-17.

***NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS**—Annual Spring Meeting, Mayflower Hotel, Washington, D. C., Feb. 17-18.

ROCHESTER ELECTRICAL EXPOSITION—War Memorial Building, Rochester, N. Y., Feb. 18-25.

NATIONAL ADEQUATE WIRING BUREAU—12th Annual Conference, LaSalle Hotel, Chicago, Ill., Feb. 23-24.

AMERICAN MANAGEMENT ASSOCIATION—2nd Annual Electronics Conference & Exhibit, Hotel Commodore, New York, Feb. 27-29.

AMERICAN SOCIETY FOR TESTING MATERIALS—Committee Week, Hotel Statler, Buffalo, N. Y., Feb. 27-March 2.

MARCH

SOUTHERN SAFETY CONFERENCE, INC.—Southern Safety Conference & Exposition, Hotel Biltmore, Atlanta, Ga., March 4-6.

SOUTHEASTERN ELECTRIC EXCHANGE—23rd Annual Conference, Boca Raton, Fla., March 12-14.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—12th Annual Conference, Hotel Statler, New York, March 12-16.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Edgewater Beach Hotel, Chicago, Ill., March 12-16.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Spring meeting, Multonomah Hotel, Portland, Ore., March 18-21.

ILLINOIS INSTITUTE OF TECHNOLOGY—18th Annual American Power Conference, Hotel Sherman, Chicago, Ill., March 21-23.

OKLAHOMA UTILITIES ASSOCIATION—Annual Convention, Biltmore Hotel, Oklahoma City, Okla., March 22-23.

PACIFIC COAST ELECTRICAL ASSOCIATION—Engineering & Operating Section, Palace Sheraton, San Francisco, Calif., March 22-23.

EDISON ELECTRIC INSTITUTE—Street Lighting Committee, Minneapolis, March 23-24; 22nd Annual Sales Conference, Edgewater Beach Hotel, Chicago, March 26-29.

APRIL

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—South West District Meeting, Baker Hotel, Dallas, Tex., April 2-4; Great Lakes District, Fort Wayne, Ind., April 16-18.

ELECTRICAL MAINTENANCE ENGINEERS ASSOCIATION—8th National Biennial Electric Industry Show, Shrine Exposition Hall, Los Angeles, Calif., April 5-7.

MIDWEST RESEARCH INSTITUTE—Symposium for Management on Applications of Analog Computers, University of Kansas City, Kansas City, Mo., April 10-11.

POINT OF PURCHASE ADVERTISING INSTITUTE—10th Annual Symposium & Exhibit, Hotel Sheraton Astor, N. Y., April 10-12.

***NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION**—Engineering & Operation Section, Hotel Vancouver, Vancouver, B. C., April 11-13.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering & Operation Section, Bon Air Hotel, Augusta, Ga., April 12-13.

EDISON ELECTRIC INSTITUTE—National Conference of Electric & Gas Utility Accountants, sponsored jointly with AGA, Hotel Commodore, New York, April 16-18; Accident Prevention Committee, Sheraton Hotel, St. Louis, April 30-May 2.

GREATER NEW YORK SAFETY COUNCIL—26th Annual Safety Convention & Exposition, Hotel Statler, New York City, April 16-20.

PACIFIC COAST ELECTRICAL ASSOCIATION—Administrative Services Section Meeting, Huntington-Sheraton Hotel, Pasadena, Calif., April 17-18.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Engineering Conference, Hotel President, Kansas City, Mo., April 18-20.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—2nd Conference on Recording & Controlling Instruments, Bradford Hotel, Boston, April 26-27.

MAY

NATIONAL FARM ELECTRIFICATION CONFERENCE—LaSalle Hotel, Chicago, Ill., May 1-2.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—North Eastern District Meeting, Rochester, New York, May 2-4.

AIR-CONDITIONING & REFRIGERATION INSTITUTE—Annual Meeting, The Homestead, Hot Springs, Va., May 7-9.

***AMERICAN WELDING SOCIETY**—Fourth Welding Show, Memorial Auditorium, Buffalo, N. Y., May 9-11.

* Additions this week

Public Service Co. of Indiana, Inc. communicates by G-E 2-way radio

Radio covers its entire system

All three operational divisions of the Public Service Company of Indiana depend upon General Electric 2-way radio to help coordinate the state's supply of vital electricity.

The all-duplex installation operates on the 25-50 mc band. District offices and generating plants maintain radio contact with service trucks and repair crews. Thanks in part to radio control, a continuous supply of electricity is generated and delivered to homes, municipalities, business and industry in 70 of the state's 90 counties.

Fourth year of service

For nearly 4 years, the G-E system has provided efficient radio service from 37 independent base stations. These coordinate the activities of more than 250 G-E equipped mobile units on 24-hour duty throughout the state.

General Electric's new Progress Line of 2-way radio is available now to help your utility operations. Call in your G-E Communications Counselor, or write: *General Electric Co., Communication Equipment, Section X1916-23, Electronics Park, Syracuse, New York.*

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Insurance Groups Cover Industry's Radiation Risks

A syndicate to underwrite radiation hazards from nuclear reactors operated by industry was formed recently by a group of about 70 capital stock casualty insurance companies. This marks the first time any insurance group has acted to meet insurance problems of atomic power projects.

The Association of Casualty and Surety Companies, speaking for the syndicate, said at present the plan was "provisional". Under the tentative program, the syndicate would assure $50-million coverage for each nuclear power project announced to date.

Insurance of construction, installation, operation, and maintenance of nuclear reactors used in industry and research would be included in the plan. The proposed coverage would be for "bodily injury and property damage liability insurance against loss or damage caused by radiation" for others than the reactor owner and operator.

J. Dewey Corsett, general manager of the Association, predicted that the plan would help to encourage more widespread use of atomic energy for industry purposes.

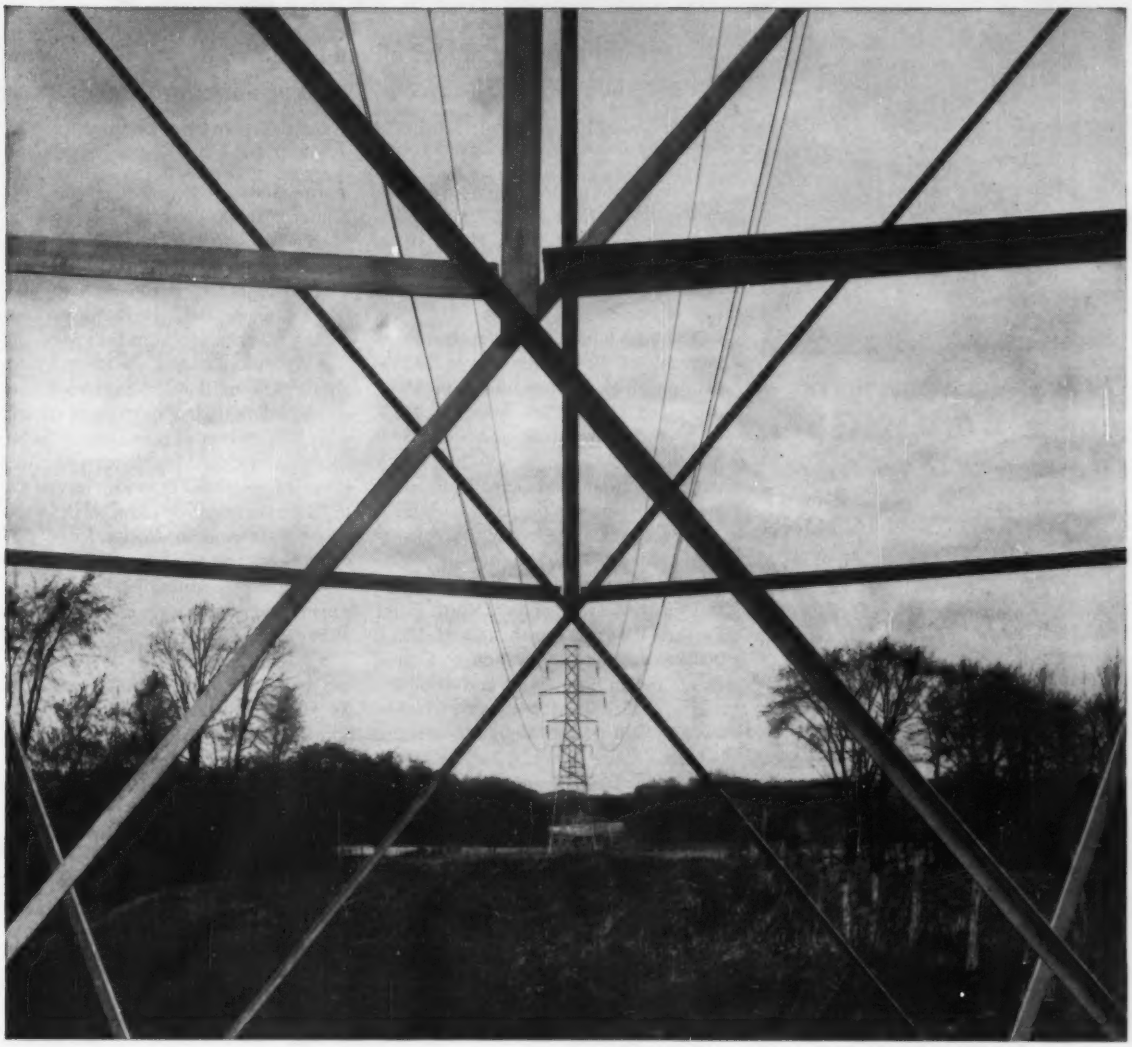
Coal Agency Ups Prices

Electric utility plants and other customers of Appalachian Coals, Inc, will pay a record high for bituminous coal starting April 1, when the company will raise its industrial contract prices for high-volatile coal in the "nut-slack" size by 15 cents per ton, boosting the price to $5.05 a ton. The increase, which occurs simultaneously with the wage boost of 80 cents daily for members of United Mine Workers, will affect customers in 26 or more states, largely in the southeast, north central, and northwest regions of the country.

Picway Unit in Operation

Completion of Columbus & Southern Ohio Electric Co's $13-million, 100,000-kw generator at Picway Station, near Columbus, has boosted the plant's generating capability to 220,000 kw, and the company's capability to 560,000 kw. Project was begun two years ago.

DOW



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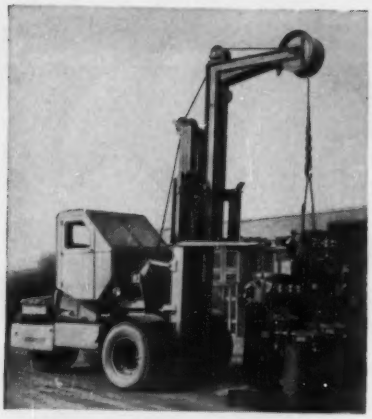

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SAVE UP TO 75% of MATERIALS HANDLING COSTS WITH

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Leading Public Utilities find these heavy-duty, rugged SILENT HOIST machines dependable and efficient for the continuous, complex requirements of the transportation department, storage area, repair shop . . . in the movement of Generators and other heavy equipment, Cable, Wire, Maintenance Supplies, Poles and general equipment.

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Construction Plans on Upgrade

. . . says EEI pointing to $2.9 billion budgeted by utilities for new building in 1956 which reverses two-year downward trend; some electric companies announce their new expansion programs

Utilities are planning to increase expenditures to a record $2.9 billion for new plants and equipment in 1956, reversing a two-year downward trend, according to an Edison Electric Institute estimate.

The $2.9-billion figure represents an increase of $24 million over 1953's previous high. Expenditures in 1954 decreased $41 million from the 1953 level, and dropped an additional $85 million in 1955.

Construction and expansion programs of some utilities are listed.

• Pacific Gas & Electric Co plans to spend nearly $130 million in 1956. This includes projects on the Kings and Feather Rivers and on North Fork Feather River, a fourth unit of 165,000-kw capacity at Station P Steam Plant in San Francisco, and completion of a second Morro Bay 165,000-kw unit and of the 50,000-kw Humbolt Bay Steam Plant.

• Consumers Power Co has announced a record $89-million construction and improvement program for 1956. Electric expansion, for which $62 million is allocated. will include two 156,250-kw units now under way at the B. C. Cobb plant, and an eighth unit of 156,250 kw at John C. Weadock plant, Saginaw Bay.

• Philadelphia Electric Co's estimated budget for the next five years is $370 million, a large portion of which will be used for the proposed generating station at Eddystone.

• Union Electric Co of Missouri and its subsidiaries plan to spend over $50 million in 1956 and almost $300 million over the next five years on new and expanded facilities. A major item in the 1956 budget is start of construction on the $40-million, 250,000-kw third section of the Meramec Plant near St. Louis.

• Baltimore Gas & Electric Co's expenditures for new construction during the next five years are estimated at $211 million, $167 million of which will be used for expansion of the company's electric system.

• Delaware Power & Light Co plans to spend $37 million in 1956, mainly for construction of two generating stations. One will be the $22-million, 50,000-kw plant located near the Tide Water Associated Oil Co now under construction near Delaware City. The other, a $17-million, 80,000-kw plant, will be built on the Indian River in southern Delaware.

• Alabama Power Co plans to invest about $150 million for expansion and construction in the next three years, with $36 million of that amount to be spent in 1956. Major items in the program include construction of a third power plant at Gorgas, the proposed $100-million Coosa River development, and four new dams.

• Houston Lighting & Power Co's construction and expansion budget for 1956 will total about $33.9 million.

• Public Service Co of Colorado has budgeted a record $27.4 million for 1956 construction, with $21.3 million of that amount to be spent in the Denver area where the company added 13,000 new electric customers in 1955.

• California Electric Power Co will spend $18 million for construction in 1956. Over half the total amount will be used for expansion and improvement of facilities in the San Bernardino area, including the first of four 60,000-kw generating units for a proposed plant.

• Jersey Central Power & Light Co plans to spend upwards of $50 million for new facilities from 1956 through 1958 to keep pace with growth in the area.

• Atlantic City Electric Co's construction budget of $14.3 million for 1956 includes a new 75,000-kw generator at the Deepwater plant and a 20,000-kw generator in the DuPont Chambers Works.

• Indianapolis Power & Light Co plans a construction program totaling $56.8 million during the four years 1955-1958. Major items include addition of the fifth unit, with 105,000-kw capability, at the Harding Street Plant.

• Monongahela Power Co is planning a $20-million improvement program over the next three years. Biggest item is a $1.3-million proposed "system improvement project" in the Parkersburg area.

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- Substations
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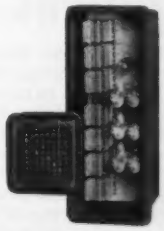
TM-15

This Telemetering System uses accurate Time-Ratio principle to measure flow, pressure, regulator position or electrical readings.

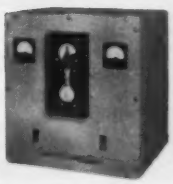


TM-16

A mechanical or electrical counting system that holds information until called for. Fast, Accurate, Self-Checking.

Battery Chargers

Features Gentle Charging. Tests battery automatically every 60 seconds . . . adjusts charging rate in small steps. A battery lifesaver!

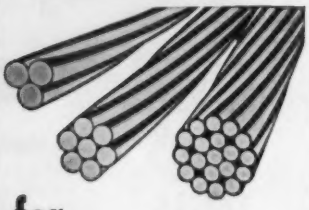


Control Corporation
The nameplate of Quality
MINNEAPOLIS

• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current

ACCO Quality

PAGE Stainless Steel Strand



for Severe Service Conditions

PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

Write us at Monessen, Pa., for complete information

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

for Better Value

PUBLIC RELATIONS

Phone Manners . . .

are important, Florida P&L tells employees; offers self-test to help improve them

Florida Power & Light Co's employee magazine, Sunshine Service News, offers this advice to improve telephone manners:

Don't bang the receiver on the hook when you have finished talking.

Don't monopolize a phone which another party must share.

Don't get irritated—be patient. Other fellow may have problems.

Don't force the other party to wait while you scramble for information.

Don't talk through a cigar or cigarette, a mouthful of candy or gum.

Don't make your phone caller wait; it is courteous to answer promptly.

These tips appear in an article by the company's Steve Harman on "How do you rate on the Telephone?" which notes that "Whenever you contact a customer, you become the company as far as the customer is concerned. This is especially true in a telephone conversation."

Test Yourself

The article goes on to advise: "Your attitude on the phone can leave the customer dissatisfied even if you do what he called to ask be done. Make it a point to speak plainly so that you're easily understood. This will make your telephone-self a mighty nice person as far as the other party is concerned."

The article offers this self-test on telephone manners:

1. Do you know the number?
2. Do you allow the party time to answer?
3. Do you speak into transmitter?
4. Do you use a natural tone of voice?
5. Do you visualize the person?
6. Do you ask if it's convenient to talk?
7. Do you say "Thank You?"
8. Do you listen attentively?
9. Do you call the other party by name?
10. Do you explain waits?
11. Do you apologize for mistakes?
12. Do you answer promptly?

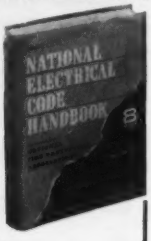
(*Continued on page* 285)

ELECTRICAL ESTIMATING
Second Edition
Just Published!

Gives help you need to estimate costs on any electrical construction job. Covers everything from selection and training of electrical estimators to cost of preliminary estimates and preparation of final bid sheets. Second Edition has entire section on labor units and includes over 500 sell price units. Discusses estimating forms, tools, plans and specifications, checking material quantities and completed estimates, etc. Includes many sample estimates. **By Ray Ashley, Elec. Engr'g. Consit. 2nd Ed., 363 pages, 208 illus., $8.00**

PREVENTIVE MAINTENANCE OF ELECTRICAL EQUIPMENT
Just Published!

Add years to the life of your electrical apparatus with these sound methods for preventing, finding, and correcting electrical troubles. Gives specific ways for better operation and maintenance of electrical equipment—to help avoid breakdowns, reduce accidents, and make for more efficient performance. Shows how to find and identify common electrical troubles, and make emergency repairs. **By Charles I. Hubert, Assoc. Prof., and Chief of Section, Elec. Eng., U. S. Merchant Marine Academy, N. Y. 214 pages, 160 illus., $4.00**



NATIONAL ELECTRICAL CODE HANDBOOK
8th Edition

Explains how to handle wiring and installation jobs in line with the 1953 National Electrical Code. Gives code rules in simple, clear language—tells WHAT they mean, HOW to apply them. New form and typesetting make book much easier and quicker to use. Index lists code rules by job title for all types of electrical installation. By A. L. Abbott. **Revised by C. L. Smith, Elec. Field Engr., National Fire Protection Association. 8th Ed., 642 pages, 394 illus., $7.50**

Just Out!

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Over 500 questions and complete answers to help engineers pass state license examinations. Covers mechanical, electrical, civil, and chemical engineering, and includes engineering economics and land surveying. Latest questions—suitable for all states. Author has worked on New Jersey examination preparation for 19 years. By William S. LaLonde, Jr., 462 pp., 234 illus., $6.50.

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Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep, plus few cents for delivery costs, and return unwanted book(s) postpaid. (We pay delivery costs if you remit with this coupon—same return privilege.)

Ashley—**Electrical Estimating**—$8.00
Hubert—**Preventive Maintenance of Electrical Equipment**—$4.00
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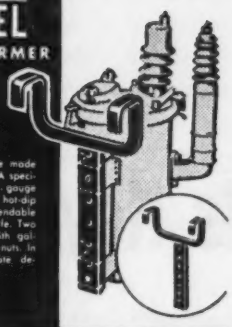
THIEL
TRANSFORMER HANGERS



THIEL Hangers are made according to NEMA specifications — heavy gauge steel construction, hot-dip galvanized for dependable service and long life. Two styles complete with galvanized bolts and nuts. In stock for immediate delivery.

MODEL	1-PHASE	3-PHASE	WEIGHT
T-1	3-15 KVA	9 KVA	16¼ lbs.
T-2	25—37—50 KVA	15-45 KVA	37¼ lbs.

C-TYPE HANGERS
Two sizes - for 75-100 KVA 1-phase and 75-112½ KVA 3-phase transformers.

HANGER KICKERS
In sizes to fit T-type Hangers — in four and five mounting positions.

Electrical Fasteners That Hold...

THIEL TOOL & ENGINEERING CO. INC.
1417 No. Market St. • St. Louis 6, Mo.

If . . .

YOU CHANGE YOUR ADDRESS

Be sure to notify us so that future copies of ELECTRICAL WORLD will be delivered promptly.

Also make certain you advise your local Postmaster so other important mail doesn't go astray. Both the Post Office and we will thank you for your thoughtfulness.

Send your new and old address to:

Subscription Dept.

ELECTRICAL WORLD

330 W. 42nd St.
New York 36, N. Y.

Phone Manners

(*Continued from page* 284)

13. Do you greet the caller pleasantly?

14. Do you identify yourself promptly?

15. Do you leave word where you are going?

16. Do you ask questions tactfully?

17. Do you always write down messages?

18. Do you signal the operator slowly?

19. Do you have paper and pencil handy?

20. Do you replace the receiver gently?

"Yes" scores 5 points; "sometimes" 2; and "no" zero. Score of 90 to 100 is excellent; 80 to 90 good; 70 to 79 fair. Under 70 is unsatisfactory.

TV Program Popular

Utah Power & Light Co's Electric Theater program is proving popular in the Salt Lake viewing area. According to the American Research Bureau, the program rates ahead of such nationally popular shows as Ed Sullivan, This is Your Life, Person to Person, Perry Como, and others. It features full length films.

Protects Pictures

For PR people who have wondered how to protect photographs from being scratched and dented by paper clips, here's a neat trick from Britain. The simple cardboard fold, shown above, goes under the clip, protects the pictures, and can be used for a message as well.

Save time testing watthour meters with the KNOPP

Meter-Testing Equipment, Type TE-7

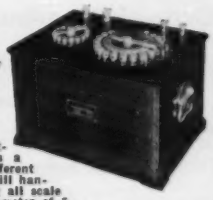
Power companies the nation over, save time, save money, and build customer goodwill when testing watthour meters with the Knopp Meter-Testing Equipment.

Has Knopp uniload† System with Unilink† series-test feature enabling testing of both elements of a 3-wire, single-phase meter simultaneously without opening the potential link.* Basic constant of rotating standard adjustable to match basic constant of meter-under-test.* Its new, more-convenient switching arrangement for connecting meter elements permits 2-element and 3-element polyphase meter testing without changing connections. Includes photoelectric counter and other time-saving features for accurate testing.

Tests all types of watthour meters. Provides voltage ranges of 120, 240, and 480; current ranges of .25, .5, 1, 1.5, 2.5, 5, 10, 15, 25, and 50. Overall equipment accuracy within .05%.

**Patented* †*Trademark*

KNOPP Calibrating Transformer, Type C-200



Adjustable ratio, high accuracy for calibrating ammeters, wattmeters, and watthour meters. Has a total of 71 different current values. Will handle calibration at all scale points of any ammeter of 5- to 200-amp full-scale rating.

Also: Knopp Precision Transformers; Knopp Uniload Equipment for testing instruments and instrument transformers.

For complete technical descriptions please write us today

KNOPP INC.

Founded in 1928 by Otto A. Knopp under the name of Electrical Facilities Inc.

4236 Holden St., Oakland 8, Calif.

Business Investment Holds Key To Both Growth and Stability

What federal tax policy will best promote both growth and stability in the American economy? The Joint Economic Committee of Congress has been asking this crucially important question in public hearings. This editorial suggests one vital part of the answer.

The proposition advanced here is that—

> Tax policy must encourage a continuing high level of business investment in new plant and equipment, because such investment makes a special contribution to *both* economic growth and economic stability.

Growth Needed for Security

We must have both growth and stability.

A vigorous economic growth is essential to our national security. As Congressman Wilbur D. Mills said in launching the Joint Committee's hearings, "The present complexion of world affairs places a premium upon strength and growth in our national economy." Growth is likewise a major ingredient of a healthy domestic economy. Growing enterprises and growing communities offer far more opportunities for satisfying careers than those which are not growing.

A reasonably stable economy, without violent ups and downs, is also essential to our national welfare. Extravagant booms and their more or less inevitable result, severe depressions, waste labor and resources and cause great human misery. Both major political parties have accepted the obligation imposed by the Employment Act of 1946, that the federal government work to maintain high and stable employment.

There is general agreement that **the key to economic growth is investment in new plant and equipment.** Growth depends decisively on new facilities to increase production, and also to produce new and better products in new and better ways. At the same time, new plant investment provides employment for the important, and well-paid, one-fourth of our industrial workers who manufacture and build new production facilities. So if the process of business investment is kept on an even keel, the result is not only growth but also stability in a substantial sector of our economy.

But authorities disagree on the possibility of maintaining a high level of business investment for any great length of time. Some fear that it will lead to an excess of producing capacity and the glutting of markets, with recession or depression not far behind.

The history of our country offers some basis for the fear that it is dangerous to maintain a very high level of business investment. There have been times when the economy has suffered under the weight of excess producing capacity. **This fear, however, has been made obsolete by the recent course of our economic history which, in its earlier phases, nourished the fear.**

The World Has Changed

Here are some of the major considerations, cited at the Joint Committee hearings, which support the conclusion that we not only *can have* a high level of business investment and economic stability but that we actually *need* a high level of such investment to assure stability.

(1) Over the next 20 years our population is expected to increase by about one-third. But most of the population increase will come in age groups younger or older than normal working ages, and people will probably work fewer hours per week. Thus hours worked are not expected to increase more than 15%. Consequently, we must have a relatively large increase in the amount of production equipment per worker if our standard of living is not to suffer. This means a high level of new investment.

(2) About half of our present business investment goes to replace worn-out equipment, rather than to expand capacity as was true during the early stages of our industrial development.

(3) Thanks largely to the impact of organized research—for which we as a nation now spend about $4 billion a year—a large share of capital investment now goes to provide new products and new processes, rather than to expand existing capacity.

These developments make it unlikely that we shall develop the burden of excess capacity that plagued the economy in earlier periods. **Moreover, most capital investment plans are now made on a long-range basis. Companies are building facilities to anticipate their needs for several years ahead.** This increase in long-range planning has reduced the disturbing effects of temporary shortages and excesses in producing capacity.

The record of recent years speaks for itself. Business spending for new plant and equipment in 1955 was over $29 billion. This continued the high level of investment that has been maintained for the past ten years—a decade remarkable for both impressive growth and gratifying stability. A McGraw-Hill survey of preliminary plans for 1956 indicates another year of increasing investment, and expanding business activity.

Tax policy, to be successful, must consider this impressive contribution of business investment to both growth and stability.

Of course, the level of investment depends on many factors other than federal tax policy. The degree of business confidence is important. So is the strength of consumer markets. So is the attitude of organized labor toward the use of more efficient machinery. But tax policy is a crucially important factor. And it is becoming more so with new developments in our changing economy. These developments indicate that tax policy **must be geared to foster a high level of business investment, if the dual objectives of economic growth and economic stability are surely to be attained.**

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

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The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

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Positions Wanted
Part Time Work

Civil Service Opportunities
Selling Opportunities Wanted
Selling Opportunities Offered

Employment Agencies
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$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

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Send NEW ADS to ELECTRICAL WORLD, 330 W. 42nd St., N. Y. 36, N. Y., for February 6th issue closing January 27th

UTILITY EXECUTIVE ENGINEER

LOCATION: Fast growing electric utility company in a large, progressive city in Florida, the nation's number one state in rate of industrial growth, and number two state in population growth.

RESPONSIBILITIES: Management of all engineering operations of company. Supervision and training of engineering department.

EXPERIENCE: Diversified engineering background in electric utility company, including a minimum of three years supervising engineers. Individual must have leadership ability, with potentiality for further advancement. Ability will be regarded as of greater importance than just years of experience.

AGE: 35-45 desirable.

SALARY: Commensurate with the high level qualifications demanded by the position.

REPLY: Confidentiality assured. Write, giving summary of qualifications to

P-8303, Electrical World
330 W. 42 St., New York 36, N. Y.

Electrical and Mechanical Engineers

Our engineering work includes distribution investigations, system planning, transmission line design, substation design, general gas engineering and the operation of steam electric generating plants.

Free group life and hospital insurance, liberal sick leave plan, five day week and a liberal vacation plan are but a few of the benefits you will receive. Engineering positions are available now for engineering graduates with less than five years of experience. Promotion from within means greater opportunity for you.

Apply in Person or Write to: R. E. Beatty

CONSUMERS POWER COMPANY
212 W. Michigan Ave., Jackson, Michigan

Electrical Engineers

Assistants to project engineers will be interviewed.

Well rounded men having 3 to 4 years experience, BS degree, interested in design of specialty transformers and voltage regulators needed. This is an opportunity to work in New England with a smaller company. Send complete resume including education, experience, salary and history to:

William P. Carpenter
The Superior Electric Company
Bristol, Connecticut

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to expedite the handling of your correspondence and avoid confusion, please do not address a single reply to more than one individual box number. Be sure to address separate replies for each advertisement.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1125 W. 6th St. (17)

POSITIONS VACANT

Junior Electrical Engineers—Five Graduates for power stations and substation electrical design. Location New York with established Service Organization for a large group of electrical utilities. Requirements: 1 to 3 years with leading electrical equipment manufacturer, G.E. or Westinghouse test course, or actual electric design, operations, construction experience on steam, diesel or hydro plants and substations. Limited foreign travel possibilities in future. Reply stating age, education, experience, personal particulars, and minimum salary expected. P-8962, Electrical World.

Graduate Electrical Engineers with or without experience for electric public utility. System protection, substation and distribution design work available. Please write full particulars: Personnel Director, P. O. Box 330, Hartford 15, Connecticut.

Electrical Engineer—Graduate—2 to 5 years experience—protective relay work with electric utility. Permanent position long established supervisory-consulting organization. Headquarters New York. Some travel Latin America. Salary commensurate with experience. Reply stating age, education, experience, personal particulars and minimum salary expected. P-8963, Electrical World.

Design Engineer—Connecter manufacturer looking for Utility-trained engineer acquainted with connector problems in the distribution field. Good opportunity. Reply stating age, education, experience and minimum salary expected. P-8929, Electrical World.

Engineer—Electrical Design. Excellent opening in expanded design department of leading control company. Design of electro-magnetic switches and controls to 1,000 amps. Permanent position. Opportunity for technical and financial advancement. Send resume to G. Franklin, Automatic Switch Company, 391 Lakeside Avenue, Orange, N. J.

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Salaried Personnel, $5,000-$30,000. This Confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personnel consultation invited. Jira Thayer Jennings, P. O. Box 674, Manchester, Vermont.

SELLING OPPORTUNITY OFFERED

Salesmen wanted who call on Telephone, gas electric companies, to sell on commission our proven safety impaction tools. Write Engineers Tool Co. 116-118 W. Main Lake City, Iowa.

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Relay and system planning engineer-experienced relay applications and system studies. PW-8986, Electrical World.

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Electrical Manufacturers agent. North and South Carolina, calling on distributor, industrial and OEM accounts, warehouse, office staff, 2 salesmen on road. Desire affiliation with live accounts this area. Commission basis only. RA-8731, Electrical World.

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The engineers and technicians you want to reach are gathered in convenient, compact groups—as this 12-page booklet points out.

It keys the job titles these men hold to the McGraw-Hill publications they read for on-the-job information. It explains how you can make contact . . . channel, concentrate your employment advertising to just the men with the job qualifications you want . . . without wasting advertising money for higher-priced space in publications with general circulation, in which you pay for perhaps 999 unqualified readers for every 1 who may meet your job requirements.

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KW	MAKE	A.C.	D.C.
1000	G.E.	13200	600
500	Westg.	2300	250
400	Al.-Ch.	2300	120/240
400	G.E.	2300	270
300	G.E.	2300	250
200	G.E.	2300	250/275
200	Westg.	4160/2200	275
200	Ridgeway	2300	250
170	G.E.	440	125
150	Al.-Ch.	2300	275
150	Westg.	2300	125/150
150	G.E.	440	275
100	G.E.	2300	250
100	Westg.	440	125
100	G.E.	440	125
75	Al.-Ch.	440	250
75	G.E.	440	125

CHICAGO ELECTRIC CO.
1324 W. Cermak Rd. Chicago 8, Ill.

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A.I.E.E. transactions back-volume wanted to buy for cash. Ashley, 27 E. 21, N.Y.C. (10).

Motor Winding Data, introductory selection 275 single and three phase motors, $1.10. Motor Service, Box 7631D, Kansas City 28, Mo.

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WATTHOUR METERS
Large Quantities
Type OB, OC, CA, I-16, I-20, I-30, JA.
Write or Call Collect
THE ELECTRICAL WATTHOUR METER CO.
76-15 Woodside Ave. Elmhurst 73, N. Y.
Phone HAvemeyer 9-0131

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IS
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—to help you get what you want
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Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

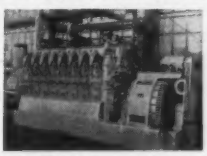
FOR SALE
WESTINGHOUSE SWITCH GEAR
New 3 Unit Westinghouse Metal Clad Indoor Lift Type Switch Gear, 6900 Volt, 100 Amp., Housing Code A, with one Breaker Oil Circuit Style #18Y9308, Type B-20-B, 600 Amp., 15,000 Volt, 3 Pole, Complete with Current and Potential Transformers, Necessary AC and DC Ammeters, and AC Voltmeters, Powerfactor Meters, Wattmeters, Temperature Indicators, Type CA Differential Relays, Type CO Induction Overcurrent Relays, Type WL Auxiliary Relay, Type SRA Voltage Regulator.

Contact: L. F. Mayfield, Room 534 Adams Building, Phillips Petroleum Company, Bartlesville, Oklahoma.

LARGE POWER EQUIPMENT
Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?
BELYEA COMPANY INC.
51 Howell St. Jersey City, N. J.

DIESEL ELECTRIC POWER
Stationary—Portable—Mobile

100 KW to 1500 KW



Engineered Diesel Power

"Union Light & Power Company" Cuba.

A. G. SCHOONMAKER COMPANY, INC.
Box 816, Sausalito, Cal. — 50 Church St., New York 7, N. Y.

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• Odd lengths—long and short—reasonably priced
One of the Largest Stocks in the Midwest
Let us quote on requirements—
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New and used equipment recently released from service by a number of electric and gas utility companies

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Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
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FOR SALE

3—1000 KVA Mol. 11500-2400/4160Y
3— 500 KVA W-H 33000-2300/2400
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3— 333 KVA A-Ch 13800-240/480
3— 333 KVA Wag 6900/11950Y-7200/12470Y
3— 333 KVA G-E 7200/12470Y-2400/4160Y
3— 250 KVA G-E 2415/2300-600
6— 200 KVA G-E 13200-2400/2300
6— 200 KVA G-E 13200-230/460
1—1500 KVA W-H 34500-2400/4160Y 3-ph., with substation equip't

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio
40 Years' Dependable Service

TVA Supporter Challenges Task Force Report

Marshall, Citizens for TVA official, claims authority has responsibility of serving entire area, says need for steam capacity is due to federal agencies

No private power company would dare say publicly that "it does not owe a responsibility to supply any community, section, or region with its power requirements."

To make this statement for public power, as the (Hoover) Task Force report does, is to apply a peculiarly warped double standard and is a typical example of the type of reasoning with two sets of premises, one for private and one for public power, which so often characterizes debates of private vs public power.

TVA Has Responsibility to Serve Area

The fact is that when Congress established the TVA and permitted it to replace private power as the monopoly serving the area with power, the TVA inherited the very same obligation private power had, and would have continued to have, if it still served that area, to wit: to supply its power needs, present and future, with the greatest faithfulness to the public interest consistent with its obligation to its stockholders to operate a profitable business. And Congress which was responsible for TVA's assumption of this obligation has the responsibility of providing the means for TVA to discharge them. This is such simple, common sense law and justice that its complete denial in the Hoover Task Force Report is so obviously a case of special pleading that it is almost incredible that people of such standing as Admiral Ben Moreell would consent to having their name attached to it. The test is very simple: "Suppose that the TVA were sold to a private utility. Can you imagine that private utility denying its obligation to serve the power needs of the area?"

As for the TVA area specifically, we see nowhere in Admiral Moreell's article even a realization let alone a statement of a circumstance which rather removes the problem in the TVA area from the field of simple argument on ideological or theoretical grounds.

Defense Loads Forced Steam on TVA

Up to 1954 the combined power consumption of all residential, commercial, and industrial users was below the 16 billion kwhr annual capacity of the *hydroelectric* facilities of the TVA. Even today it is roughly equal to the 20 billion kwhr combined capacity of the TVA and Cumberland River hydro-facilities. In other words, if the TVA were serving a typical utility area, it would not have needed steam facilities except for stand-by use in periods of low-water or peak demand until the past year or so.

Unfortunately, for the validity of the Task Force Report, so far as it applies to the TVA—and for other anti-TVA proposals—the widely held assumption that the TVA faces a typical utility system problem is completely in error. And the most ominous implication of Admiral Moreell's article is the fact that either through ignorance or deliberate decision it fails to point this out. Apparently the following facts will therefore be rather startling news to the readers of Electrical World:

One of the most determining reasons for the establishment of the atomic facilities at Oak Ridge was the ability of the TVA to meet the fantastic power requirements quickly, efficiently, and with a maximum of security. We people of the Tennessee Valley were never consulted and had no option despite the fact that its presence would necessarily consume the reserves of power for the future which the TVA plan envisaged. How serious that inroad into TVA's capabilities has in fact turned out to be is indicated in the following figures which give the growth of power requirements for the "normal" customers and this special customer represented by U. S. atomic (and to a minor degree other defense) installations.

Load of Defense Agencies Soared

In 1945 the TVA fed 12.3 billion kwhr into its transmission lines consumed as follows:

Transmission losses	0.7
Consumers served by distributors	3.3
Industry served directly by TVA	5.0
Federal agencies	3.3

In the fiscal year ending June 30, 1955, the TVA fed some 44 billion kwhr into its lines, distributed as follows:

Transmission losses, roughly	2.0
Consumers served by distributors	14.
Industry served directly	6.0
Federal agencies	22.

It requires only third grade arithmetic to note that in 1955 52% of all the power sold by the TVA went to federal agencies, almost all of it for vital atomic defense production.

Less TVA Capacity Would Harm U.S.

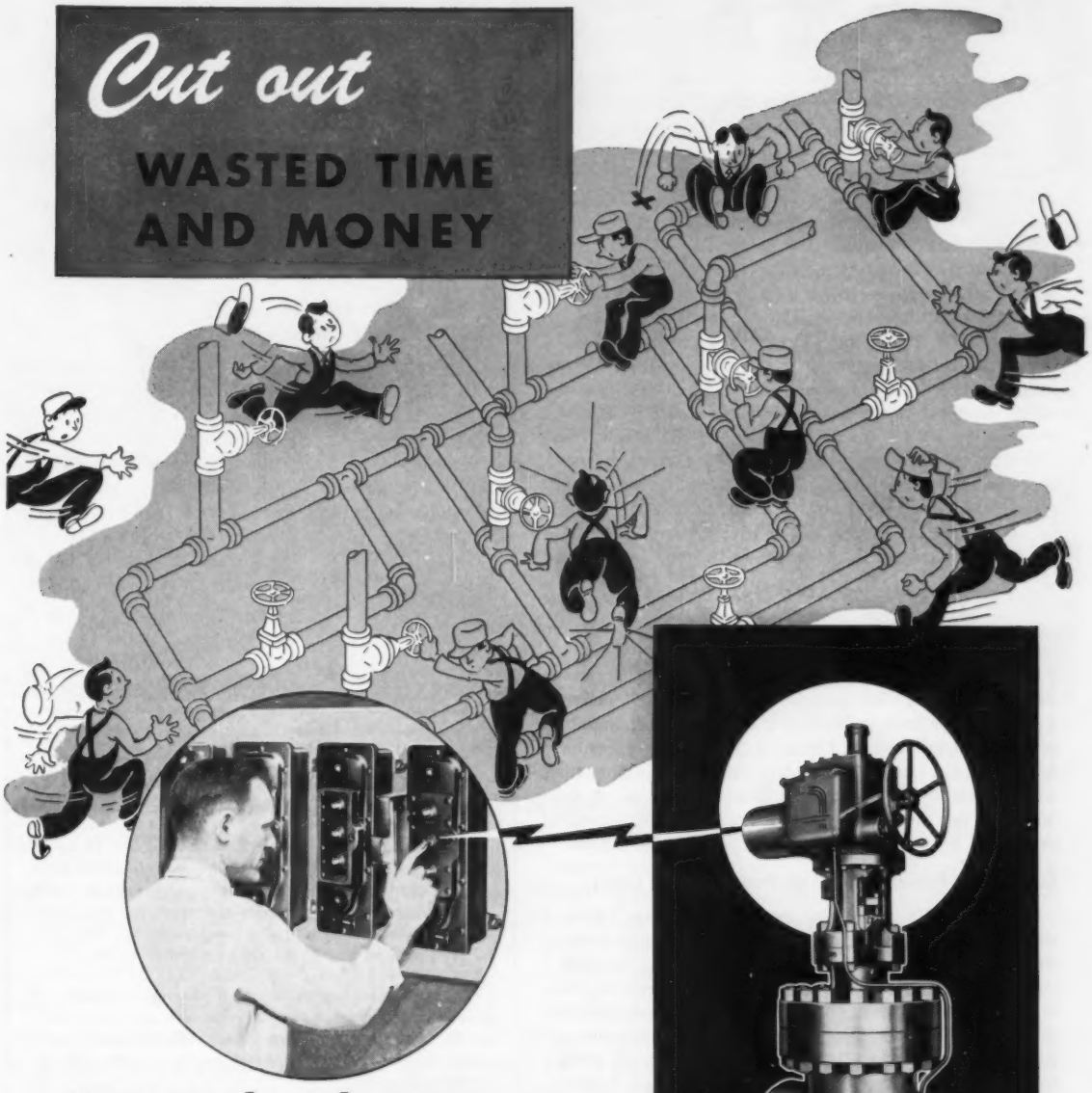
Who then needs TVA power? The people of the Tennessee Valley or the people of the entire United States, assuming that Admiral Moreell grants that our atomic production concerns all the people of the U.S.? And who will be hurt if the TVA cannot enjoy the privilege (as Admiral Moreell appears to look at it) or the obligation (as we prefer to look at it) which every power utility has to meet the power needs of its customers?

Like it or not, you cannot whittle the TVA down to a size the private power advocates would like to have it without hurting Uncle Sam. Admiral Moreell ought to know, and your readers and certainly the public are entitled to know, that any attempts to limit TVA's capacity to expand flirts with our national security.

This is not a matter of our own choosing. For that matter, neither the people of the U. S. nor the private utilities had any voice in establishing this circumstance. It was a product

(*Continued on page* 292)

Cut out
WASTED TIME AND MONEY



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TVA Supporter Challenges

(*Continued from page* 290)

of war need and presumably represented the best judgment of the people responsible for conducting the war. But it is a fact which no amount of special pleading, absurd double-standard logic, or wishful thinking can dispose of, though it can obscure it. It is a fact which must inevitably condition all phases of all argument affecting the TVA. For example, there is the always brought up subject of federal taxes: Should any increase of rates which might be needed to pay such taxes apply equally or proportionally to all power consumers, in which case Uncle Sam would pay more than half the cost and make no net profit on the operation. Or should the TVA have an additional set of books: one for the portion of its operations serving defense agencies, another for normal consumers. In that case the whole capital structure picture would be changed from that pictured by TVA's enemies; and we would have to deal with two TVA's, to wit: the TVA serving federal agencies and the TVA serving normal power consumers. As things stand, in terms of power load the normal consumer might be said to use the surplus power of a TVA principally in the business of supplying defense loads.

Presents Facts to Support TVA

We believe, it is a fact which the readers of Electrical World, as responsible citizens, would want to know.

We would like to comment on the other points in Admiral Moreell's article which deal with the Public vs Private Power issue in principle. This, however, would be going over ground which I have no doubt your readers have treaded many times previously without changing their minds. Might we, however, present two series of facts which in our view belie some of the misstatements about the TVA.

Says TVA Repaid 40% of Power Plant Costs

1. The TVA's customers, though their power bills and other fees, rents, etc., have already paid for about 40% of the total cost of TVA power facilities now in use and a third of those in use plus those under construction. Specifically, of the $1.2 billion cost of present facilities $300 million (or roughly 25%) came directly from power revenue profits. Moreover, the TVA has repaid some $200 million (or about 23%) of the remaining cost to the U. S. Treasury and bond-holders who between them contributed the remaining 75% of the total cost. This amounts to a total of $500 million or roughly 40% of the $1.2 billion total cost.

Furthermore, the TVA has repaid these "loans," appropriations, or whatever you want to call them, at a rate far in advance of contracts and commitments. For example, the $65 million bond issue was retired 12 years in advance of schedule (incidentally, the TVA paid $10 million in interest on them which, of course, does not enter in the above tabulations), and the rate of repayment to the Treasury is many years ahead of schedule. The plain everyday citizen will be gratified to know that so large a proportion of the cost has been paid back in whatever form.

2. The distributors of power (municipalities, REA co-ops and a few private companies) are making money, despite the low rates, and with bookkeeping which is comparable to that of private utilities. In 1954 (last year for which figures are presently available) their average balance sheet looked like this:

Credits. (Sources of Income)

From sales to residential users	54.7%
From sales to small industrial and commercial users	19.8
Sales to large commercial and industrial users	22.6
Street lighting and misc.	2.9

Debits.

Purchased power	41.9%
Distribution costs	11.9
Administrative costs, sales promotion, etc.	10.5
Taxes	4.5
Interest	2.9
Depreciation, Amortization, etc.	12.2
NET EARNINGS	16.1

As a matter of fact, distributors are held by contract, in accord with Congressional policy, to use profits only to expand their facilities or to reduce rates. Naturally, they first employ profits to expand. But of the 150, more or less, no fewer than 50 have now reduced rates and their financial position figures in the above average.

We don't see how in view of these figures anyone can deny that public power in the TVA area is profit-making.

Joseph Marshall
Executive Director

Citizens for TVA, Inc
Hermitage Hotel
Nashville, Tenn.

Editors Note

We feel compelled to enter these observations on the above letter in an effort to keep the record straight:

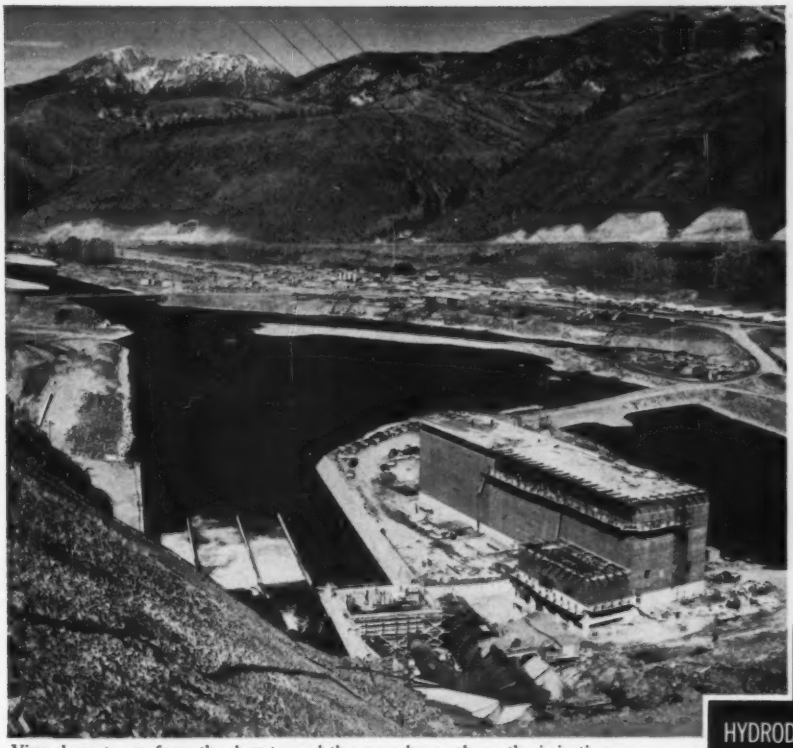
1. Federal power operations are not electrical utilities in the usual sense. Congress has never voted TVA, Bonneville Power Administration, or any other large power agency a utility responsibility. The City of Memphis in the TVA area can testify to this.

2. The government may, if Congress deems it necessary, produce power for its own purposes such as the atomic energy program without assuming a utility responsibility for everyone in a 100, 200, or 2,000-mile radius.

3. In the condensation of the Moreell speech, to which Marshall refers, no contention was made that there is no profit to be made from federal power operations. Moreell contended rather that the federal government is losing money on its power operations.

4. Marshall sees fit to avoid the disclosure that TVA is selling power to Atomic Energy Commission, a sister federal agency, at a greater return than it gets from other customers. If the federal government can pay itself for power and energy produced in its own plants, it does not seem unreasonable that it might also figure out the fair tax contribution that should come from the power operation.

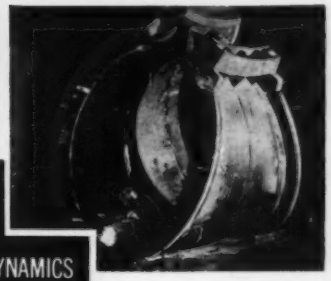
5. Nor has Marshall replied to the Moreell disclosure that TVA is buying power from the Cumberland River projects at 60 to 80% of federal cost and 30% of the value of the power.



View downstream from the dam toward the powerhouse shows the irrigation bypass (left), penstock (center) and tail-race canal (right). *(U.S.B.R. photo)*

Final check assembly of Unit #2—a complete scroll case, pit liner, distributor gates and operating mechanism—is made in SMS shops prior to shipment to the site.

Welding a flange to a section of Unit #3's spiral steel case. SMS shops are completely equipped to fabricate weldments of the largest types.



HYDRODYNAMICS

MILE-HIGH SMS-FRANCIS TURBINES SOON TO DELIVER POWER AT PALISADES

High on the south fork of Idaho's Snake River, the first of four SMS-Francis turbines at Palisades Dam is scheduled to go on the line in 1956. The Palisades Dam, which is the Bureau of Reclamation's largest earth-filled dam, is primarily an irrigation project. The dam will have a crest length of 2,100 feet, rise 270 feet above the streambed, and provide a storage reservoir some 20 miles long and 3 miles wide.

Four vertical SMS-Francis turbines will be installed to produce a total capacity of 114,000 kw. Designed to operate at a site more than a mile above sea level, each unit is rated at 39,500 HP under a 190-foot head. The power generated will serve southeastern Idaho, where Atomic Energy Commission facilities and a growing phosphate industry now tax the existing electric supply.

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WASHINGTON COMMENT

John Day Project Key to Partnership

Eisenhower backing improves chances of Congressional acceptance of the Coon bill. Action on this legislation puts Eisenhower policy to its biggest test

Although the Interior department had made its recommendation to the White House months before, it was not until Congress convened this year that President Eisenhower indicated publicly his endorsement of a partnership approach to construction of John Day Dam on the Columbia River in Oregon.

The $310-million, 1-million-kw project already has been authorized as a strictly federal plan by a previous Congress. And last year, the Democratic-controlled legislative body granted the Army Corps of Engineers $500,000 to proceed with planning.

Last year, Congress also received a bill which would make it possible for the government to save the $273-million cost of building the dam's power facilities, leaving federal investment at only $37 million to cover flood control and navigation features. Rep Sam Coon, Republican of Oregon, introduced this legislation late in the session at the suggestion of three Northwest utilities—Washington Water Power, Portland General Electric Co, and Pacific Power & Light Co.

Any Utility May Share

In payment for footing the entire power facilities bill, the utilities would receive 50-year contracts for the dam's hydro output. A key feature of the bill was its open invitation to area public utilities to join the power companies, sharing in the power output in proportion to the amount of contribution they would make toward cost of construction. No acceptances of this offer have been reported.

Eisenhower's endorsement came briefly in his State of the Union message on Jan. 5. In that discussion of the nation's progress and the administration's future plans, the chief executive urged Congress to authorize three specific power projects—Upper Colorado and Fryingpan-Arkansas, his two pet federal developments, and John Day. He referred to John Day as the "John Day partnership project."

This means the Administration now regards it formally as a partnership proposal, rather than a federal venture.

"I strongly recommend that action be taken at this session . . . on the John Day partnership project," the President's message said, "and other projects which provide for cooperative action between the federal government and non-federal interests, and on legislation, which makes provision for federal participation in small projects under the primary sponsorship of agencies of state and local government."

Opponents to Use Every Trick

Eisenhower promised Congress a "comprehensive program for water conservation" later in the session. This should spell out in detail his thinking on other partnership projects he would like to see approved.

Eisenhower's action lends powerful support to Coon's bill. It should be enough to pull most Republicans into line behind the legislation, and it may sway more than one Democrat who is not wedded to the federal power line of Senators Morse, Neuberger, and Kefauver. These advocates of expanding federal facilities will, of course, attack the President's proposal with everything from appropriations riders to long-unused House rules.

Their tactics threaten to block the conversion of John Day during the session which has just begun. But Coon's bill carries such a persuasive inherent economic argument that it cannot be ignored forever. Republicans will build a substantial record on this during the hearings and debates to come in an effort to solidify voter support behind the partnership policy.

TECHNICAL NOTES

Hand regulation of a small industrial-plant generator operating in parallel with a utility system should be set for rated pf at average load. Upward load swings then approach unity pf; downward swings, more lagging.

Boiling-water reactor at Argonne Laboratory drives a 3.5-Mw turbine-generator with steam up to 300 psi. Power cost, counting U235 at $15 per g, is 30 mills per kwhr, nearly half of which is capital and operating cost. Major component of fuel cost is for fabrication and processing.

Russia's 5,000-kw nuclear power plant, PW-cooled, graphite-moderated, operates on a 550-kg charge of enriched uranium to produce 600,000 lb per hour of steam at 184 psi 481-490F. Installation has produced 15 million kwhr during a year's operation with several fuel element replacements during shutdowns.

Instrumentation costs 7 to 10% of investment in modern power plants compared with 1 to 2% only 10 years ago.

Ice-thawing of overhead lines is better done at 25 cps if available because both impedance and volt-ampere requirements are lower at reduced frequency.

Oil flow doubles when wax-like plugs in oil-bearing sands are melted by electric heaters of 5 to 20 kw lowered into the well to production level.

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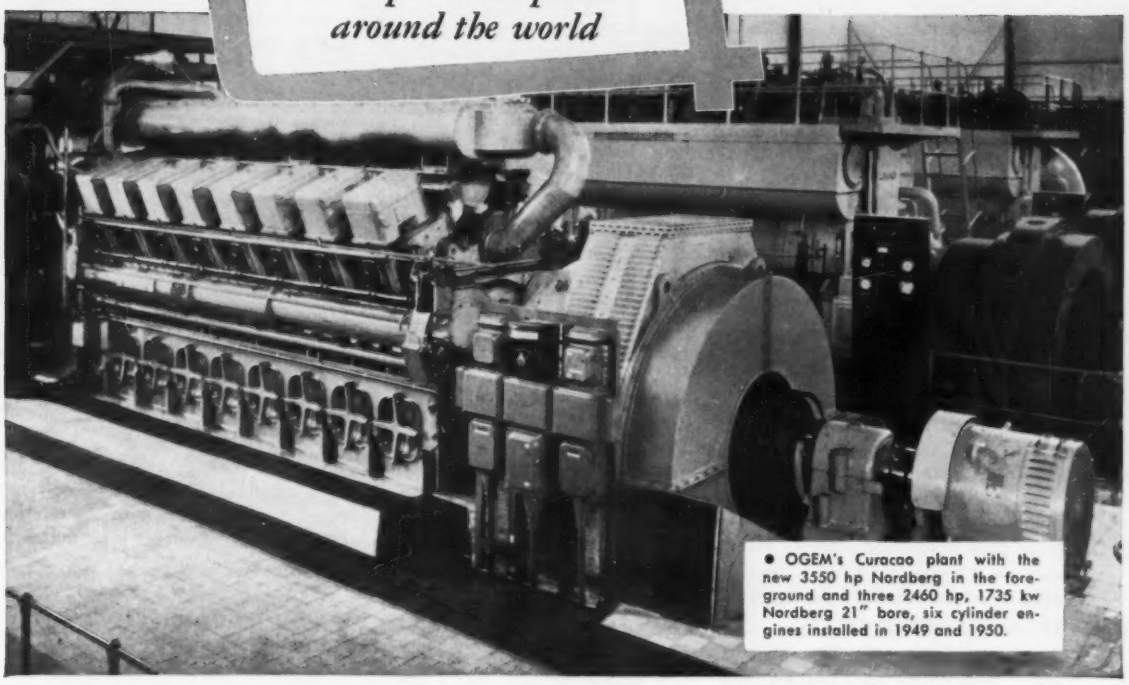

• OGEM's Curacao plant with the new 3550 hp Nordberg in the foreground and three 2460 hp, 1735 kw Nordberg 21" bore, six cylinder engines installed in 1949 and 1950.

Netherlands West Indies Utility installs its 10th NORDBERG DIESEL

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Installed at Curacao, the new engine gives this plant a total of 10,930 Nordberg horsepower. Four Nordberg *Supairthermal* engines are also providing 5640 hp at this progressive utility company's Aruba Island plant, and two 2670 hp V-type engines were recently placed in service at the Paramaribo station. *A total of 21,910 Nordberg horsepower!*

When additional power was needed, users like N. V. Overzeese Gas En Electricitiet Mattschappij, *naturally chose Nordberg again.* They have had proof of Nordberg's reliability and low operating and maintenance cost. *It's what they expect of Nordberg Engines!*

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P955

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Alaska Development Pushed

(*Continued from page* 119)

The Post claimed Reynolds Metals Co, originally interested in the Canadian proposal, had backed out of the plan without notifying Ottawa of its actions or its reasons. The newspaper hinted Washington pressure had caused this withdrawal of support by an industry vital to such an undertaking.

U. S. State Department officials deny this and indicate the belief that the state of unsettlement of the diplomatic questions involved was the real cause of Reynolds' withdrawal. Their denial was bolstered by the report that the Canadians themselves had abandoned their first site choice to study an alternate dam and power-plant location.

The Canadian newspaper indicated the same pressures had been brought to bear on a New York architect-engineer firm which had reported favorably on the site to Reynolds then changed its mind about taking a major interest in the Canadian project.

U. S. Plans Indefinite

Compared to the Canadians' plans, which are still in the early investigation stages, the American proposal has yet to leave the ground. The Reclamation Bureau's Alaska District office, for instance, needs much more hydrological data before it can even begin to estimate costs. And Reclamation officials feel they must have a working agreement with Canada so that both can pool their information as they did in recently declassified 1951 study.

After the 1951 study was made, it was classified at the insistence of Canada which was just beginning to take an interest in an all-Canadian development. Additional joint studies which had been planned were dropped when Canada refused to join in.

As a result of the 1951 study, the Reclamation Bureau drew preliminary conclusions as to the Yukon's potential under joint development, and a tentative course of action was outlined. The Bureau then envisioned dropping 2,800 cfs 1,900 ft through a 14.35-mile tunnel from the foot of Lindeman Lake to a powerhouse on the Taiya River, which feeds into Taiya Inlet, a coastal tributary of the Lynn Canal along the panhandle shore near Juneau (see map, p 119).

Reclamation Bureau District Manager Daryl Roberts says his estimate of 2.2-million kw of potential 2.1-mill Yukon-Taiya power is conservative. He emphasizes that this amount would be prime power, deliverable continuously under all conditions. But he realizes that such a vast power development would not be feasible without assurance that giant aluminum and other metals reduction industries would locate in the area.

Roberts says that Yukon-Taiya, if fully developed, would be the biggest electric generating facility under the American flag.

His plan calls also for thorough investigation of the Rampart site, far downstream on the Yukon in the vast central Alaska flats, 31 miles downstream from Rampart village. This project, he states, could produce billions of kwhr of 4-mill power from an installed capacity of at least 4-million kw. However, data collection so far has consisted chiefly of stream-gaging, and Roberts does not have sufficient information on which to base a cost estimate.

Roberts and interested Alaskans claim development of the Canadian project would preclude any American program because it would divert at least 1,800 fps of water. This much diversion from the Yukon's sources would adversely affect the feasibility of the Rampart project and perhaps make the Yukon-Taiya project uneconomic.

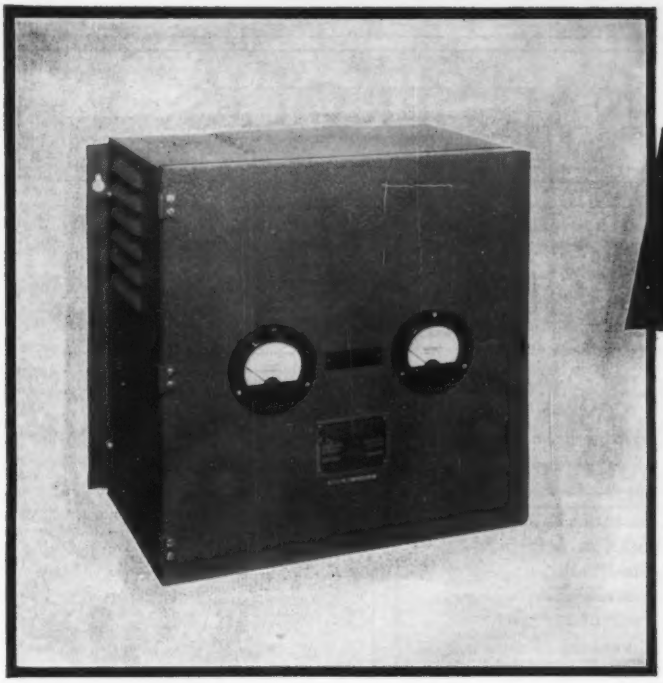
Lists Possible Projects

Rampart and Yukon-Taiya are the two big projects in the Bureau's file of Alaska power sites. In recent Alaskan field hearings, the House Interior Committee heard Roberts list these others (see map) as projects which could enable Alaska to develop fully the 46-billion kwhr pouring yearly into the sea:

- **Teklanika Project** at river mile 66 on the Teklanika River, a tributary of the Nenana River—This project would develop 12,000 kw producing 54-million kwhr per year of firm energy to meet the Fairbanks area's non-military needs for 60-million kwhr per year.
- **Cathedral Bluffs Project** on the Tanana River, 179 miles from Fairbanks—Little is known of the area or stream flow, but Roberts estimates the project could develop 100,000 kw.
- **Devil Canyon Project** at river mile 134 on the Susitna River—Proposal is to develop 195,000 kw at this site to serve the railbelt area of Alaska. If upstream storage were provided, Roberts told the committee, capacity could probably be boosted to about 400,000 kw. Devil Canyon would impound 2.9 million acre-ft of water and produce power at 9 mills or less, Roberts believes. The project is programmed for Reclamation Bureau study in 1956.
- **Caribou Project** on Caribou Creek at mile 110 on Glen Highway northeast of Anchorage—Now under Reclamation Bureau investigation, this site could contain 30,000 kw of capacity, Roberts estimates.
- **Wood Canyon Project** on the Copper River, 3 miles below the confluence of the Copper and Chitina Rivers, 75 air miles northeast of Cordova—It is estimated to be capable of producing 6.7-billion kwhr of firm power a year. The Harvey Aluminum Co has been granted a preliminary permit to study it.
- **Lake Dorothy Project** 16 miles southeast of Juneau—There is now only 7,200-kw hydro and 2,500-kw diesel in the Juneau area. Lake Dorothy could add 26,000 kw, producing 127-million kwhr firm each year to help supply a proposed paper mill.
- **Blue Lake Project,** 7 miles east of Sitka on Barnoff Island—It is proposed to install 11,000 kw here to produce 54-million kwhr per year of firm energy.
- **Swan Lake Project** on Revillagigedo Island 22 air miles northeast of Ketchikan—In 1954, a $46-million pulp mill was completed near the site. At a cost of 12 mills per kwhr, 15,000 kw would be installed. Output would be 71-million kwhr.
- **Lawing Project** on Kenai Peninsula 25 miles northwest of Seward, near Lawing station on the Alaskan railroad—Twin hydro projects on two lakes could develop 16,000 kw.

Testimony during the field hearings showed that Roberts and southeast Alaskan residents believe the best way to develop the Yukon's hydro potential is to entice industry into the area.

But as a result of Alcoa's recent operation of a lignite-fed plant at Rockford, Texas, the current view is that aluminum companies profit by locating near raw materials if a choice must be made between these and cheap power. This change of emphasis could doom both the American and Canadian plans to develop the Yukon.



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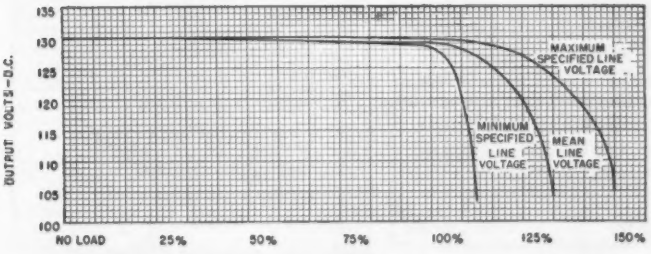
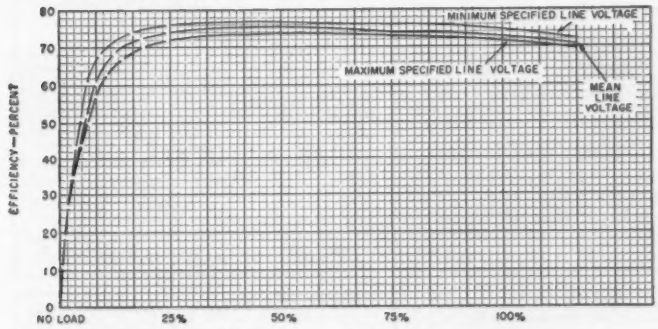


Regulation Curve (note automatic current limiting at overload to protect equipment)



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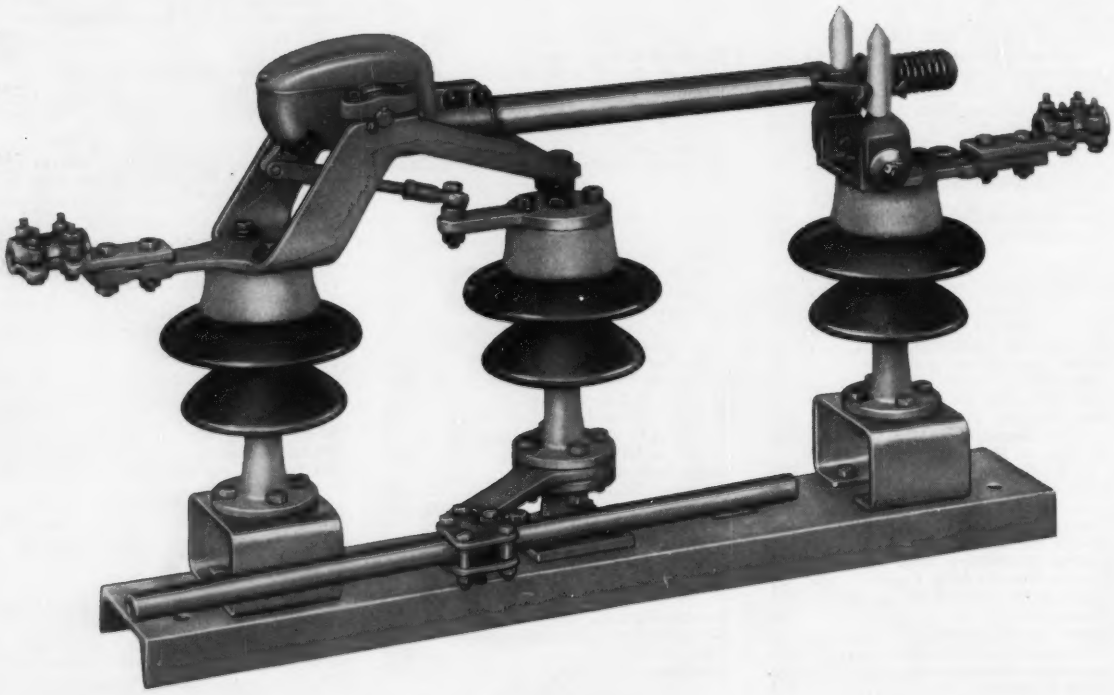

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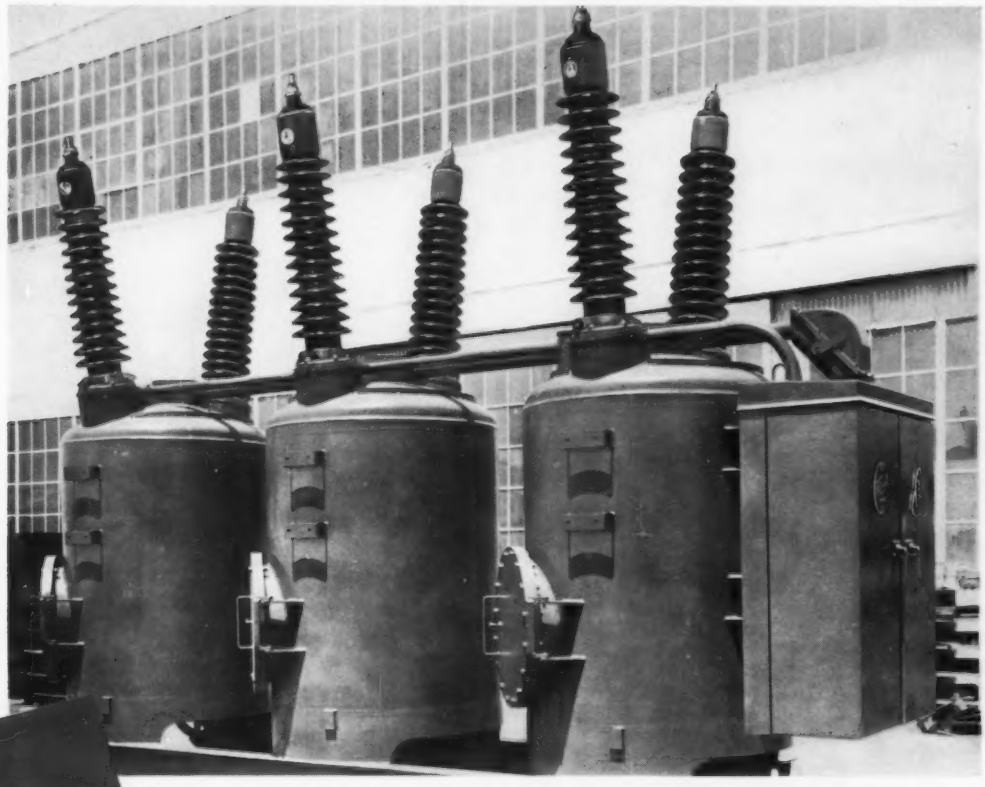

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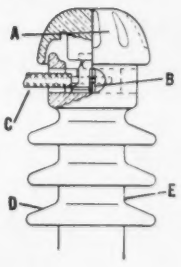

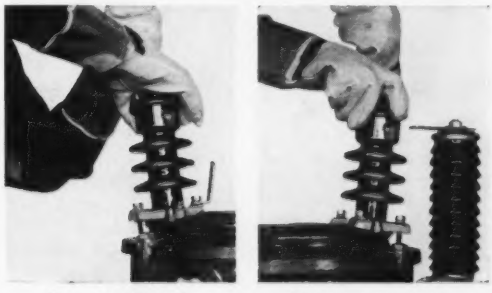

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